



The British Orthodontic Society Clinical Effectiveness Bulletin

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Chairman's remarks.

What are we carrying out?

Clinical audit? Clinical effectiveness? Clinical governance?

The latter term is defined on the Department of Health website as: "The system through which NHS organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care, by creating an environment in which clinical excellence will flourish."

A long sentence, even by DoH standards, but one which reminds us that although we have always been responsible to our patients for maintaining high standards; we are also increasingly accountable to those who employ and pay us.

With the advent of a new contract, whenever that occurs, it is highly probable that auditing outcomes will become mandatory. This may involve PAR scoring of completed patients – 50 per year or 10% of cases has been suggested. This audit process will be monitored by your PCT (or whichever new body replaces it, following yet another spasm of restructuring). Thus audit, with

its central role in clinical governance, will become more firmly established; although funding is as yet unclear.

The Clinical Effectiveness Committee will need to evolve to meet this challenge. It is our intention to adopt a more supportive and advisory role for BOS members to carry out audit and peer review. This process is already well underway. Members visiting the CEC area on the BOS website will see sections titled "Getting started in Audit" and "Audit recipes". In addition all previous newsletters and bulletins are archived, which allows prospective auditors to see who's done what previously.

This year's Bulletin is weightier than ever. It is packed with a wide range of articles and all have been peer reviewed by our FTTAs. The issue also includes, for the first time, three literature reviews. My thanks, as ever, go not only to Gavin Barry and Jeremy Knox for all their hard work editing this publication; but also to the FTTAs for their invaluable contribution.

Julian O'Neill November 2005

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USER INVOLVEMENT IN ORTHODONTICS: A REGIONAL SURVEY OF PATIENT SATISFACTION WITH FIXED APPLIANCE TREATMENT

Jay Kindelan, York Hospital

INTRODUCTION

There is a drive from the Department of Health for patients to become increasingly involved in healthcare decisions¹. Whether this relates to the environment in which treatment takes place, or techniques utilized, we are encouraged to consult our users for feedback on our performance as clinicians^{2,3}.

This report details an audit carried out in 13 orthodontic centres involving 315 patients. Patients were asked to complete a questionnaire on the day of fixed appliance removal. Over 99% reported satisfaction with the treatment result, however other interesting effects of treatment were reported, most notably discomfort levels. Information regarding response rate was unavailable, therefore, results exclude patients failing to return their forms. The survey did include patients debonded early for poor oral hygiene or repeated breakages.

Orthodontic treatment generally produces vast aesthetic improvement. Treatment, however, can be associated with considerable discomfort, particularly immediately after appliance adjustment. This discomfort tends to be poorly perceived by clinicians as it takes place at a distance from the clinical setting.

Patient satisfaction surveys have been carried out previously in the North Yorkshire region, initially in 1994⁴, and then re-audited in 1998⁵. Levels of satisfaction were 91.8% and 96.3% respectively. This current audit was initiated through the Yorkshire Orthodontic Regional Audit Group (YORAG), which consists of consultants and specialist practitioners from the Yorkshire region.

METHOD

An audit was conducted to survey patient satisfaction after fixed appliance treatment. The protocol for the audit was approved by YORAG, and 13 centres for orthodontic treatment in the region agreed to participate. These included hospital based orthodontic departments together with two specialist orthodontic practitioners. All patients who completed orthodontic treatment with fixed appliances between 1st March and 31st May 2003 were included. A questionnaire was provided to each patient at the time of debond. The questionnaire was based on one used in previous local audits and included questions regarding:

- problems during treatment
- effects of treatment
- satisfaction with treatment

The form completed by patients was designed in conjunction with the clinical effectiveness unit at York Hospital. The form was capable of passage through an optical character reader in order to facilitate data analysis.

RESULTS

A total of 315 completed questionnaires were returned. Information regarding response rate was unavailable.

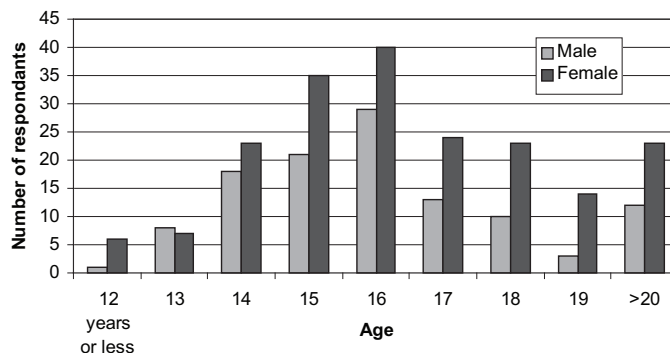


Figure 1 – Age and gender of patients included in survey

PROBLEMS DURING TREATMENT

Approximately two thirds of patients reported moderate or serious problems in relation to pain or discomfort in their teeth and gums during treatment. This is often not appreciated by clinicians as it tends to happen outside the clinical setting. Over half of the patients had moderate or serious problems with trauma of their cheeks and lips from the fixed appliances.

It is often thought that patients worry about missing time from school or work. Although the majority of patients were of school age, 68% reported no problems in relation to time away from their school or workplace. The remaining 32% of patients did, however report it to be a source of some difficulty.

Most of the patients (93%) reported no problems with being teased as a result of their appliances. This is perhaps a reflection of current trends dictating that orthodontic appliances are relatively fashionable.

Effects of treatment

Nearly all (98%) of patients reported a significant improvement in the appearance of their teeth; this is obviously reassuring. Figure 2 indicates the proportion of patients reporting improvements as a result of treatment.

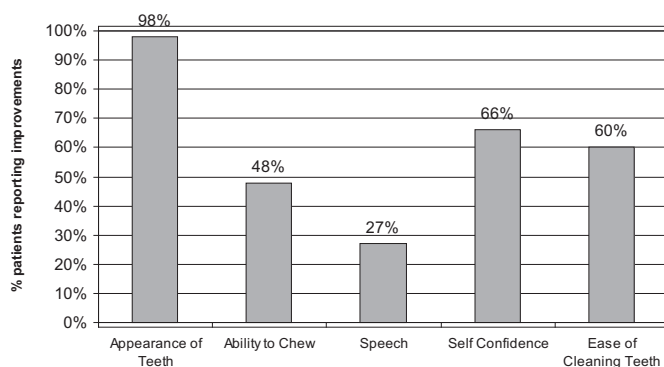


Figure 2. Improvements reported

Irregularity of teeth prior to orthodontic treatment can be a hindrance to adequate oral hygiene and 60% of patients reported an improvement in the ease of tooth brushing after treatment.

About 30% of patients reported that treatment took longer than expected or they had problems with repeated breakages. Only 5% said their teeth were not as straight as expected.

Satisfaction

All but one of the patients stated that they were satisfied as a

result of treatment (>99%) and nearly all (96%) of patients stated that they were glad they had received it. Out of the remaining 6 patients, 5 were not sure and only one said they weren't glad. This patient reported serious problems associated with the length of treatment and felt their braces were uncomfortable or painful. They still rated their overall satisfaction as 'fairly satisfied'. Ninety three percent of patients stated that they would recommend this treatment to a friend or relative.

Comparison between centres

The mean satisfaction scores were compared for all of the orthodontic treatment centres. Very little difference was displayed between the centres, although numbers within each centre were too low to allow for statistical analysis.

SUMMARY

It is recognised that orthodontic treatment is associated with extremely positive outcomes for both the patient and healthcare professionals alike. This multicentre survey carried out in 13 different centres throughout the Yorkshire region confirms this.

The collaboration of hospital based orthodontic practitioners with specialist practitioners is to be applauded. Consulting patients with regard to their treatment will become increasingly important.

RECOMMENDATIONS

- A re-audit should be undertaken in five years time to include more specialist practice centres and general dental

practitioners who treat orthodontic patients based on consultant treatment plans. Response rates should be included.

- This report will be circulated to all participating centres and displayed within orthodontic waiting areas for patients' information
- Clinicians should be aware of the discomfort patients suffer during active orthodontic treatment. They should be sensitive to that particular aspect of patient care with specific reference to the issue of informed consent
- Clinicians should give consideration to the use of 'optical character reader' forms for audit projects

Acknowledgements

I would like to thank my friends and colleagues within the Yorkshire Orthodontic Regional Audit Group for the time spent taking part in this audit. I am grateful to the Clinical Effectiveness Unit at York Hospital for their help in designing the optical character reader form, and in analysing the data.

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2. *The Commission for patient and public involvement* (www.cppi.org)
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CONSULTANT SUPERVISION IN AN ORTHODONTIC TRAINING PROGRAMME

Scott Deacon, David Bearn. North West (East) Deanery

INTRODUCTION

High levels of consultant supervision are thought to be ideal for clinical training of specialist registrars. Specific supervision levels are not set by national guidelines. These are decided at a local level by training programmes or individual consultants. This has been highlighted in previous audit reports.^{1,2} RCS Eng has recommended at least 60% supervision.

AIMS

The aims of the audit were to establish current levels of supervision and to quantitatively assess the level of active training received by orthodontic trainees from their respective consultants during outpatient clinics in the North West (East) Deanery.

METHODS

The eleven orthodontic trainees (eight SpRs and three postgraduate MSc students) recorded a four-point graded scale of supervision previously described.¹ Additional data was recorded at each session on a proforma sheet at District General Hospitals and University Dental Hospital of Manchester during a 3-month period. This included the number of patients seen by the trainee and the number of these actively seen by a consultant. The consultants were blinded from the data collection period.

AUDIT STANDARD

Standards for the North West (East) region were set after discussion with the Training Programme Director. These levels included:

1. A consultant should be available in the department for a minimum of 80 % of sessions. This allows for annual and study leave to be taken without falling short of the required level of supervision.

2. The level of supervision should allow for a minimum of 50 % of the attending patients to be actively seen by a consultant. This equates to each patient being seen by the consultant on alternate visits.

RESULTS

The response rate during the 3-month period was 47.5 % of the available trainees' clinic sessions had a completed proforma from within the region.

Cover provided	Frequency	Percentage (%)
Consultant available with no other commitments	257	63.0
Consultant available with other commitments	93	22.8
Consultant out of department but within hospital	13	3.2
Consultant unavailable	39	9.6
Total	402	98.5
Incomplete forms	6	1.5
	408	100.0

Table 1: Regional figures for consultant cover

The regional figures for consultant availability within the department exceed the audit standard of 80 %.

	Consultant available with no other commitments	Consultant available with other commitments	Consultant out of department but in hospital	Consultant unavailable
1	69% (33)	21% (10)		10% (5)
2		100% (22)		
3	51% (22)	16.5% (7)	14% (6)	18.5% (8)
4	80% (28)			20% (7)
5	27% (10)	62% (23)		11% (4)
6	92% (33)	8% (3)		
7	95% (36)			5% (2)
8	100% (7)			
9	81% (52)	8% (5)	1.5% (1)	9.5% (6)
10	25% (10)	47.5% (19)	12.5% (5)	15% (6)
11	92% (24)	8% (2)		

Table 2. Regional figures for individual consultant's supervision

Table 2 demonstrates that the majority (9 out of the 11) of consultants were available within their department and this exceeds the standard set for the region.

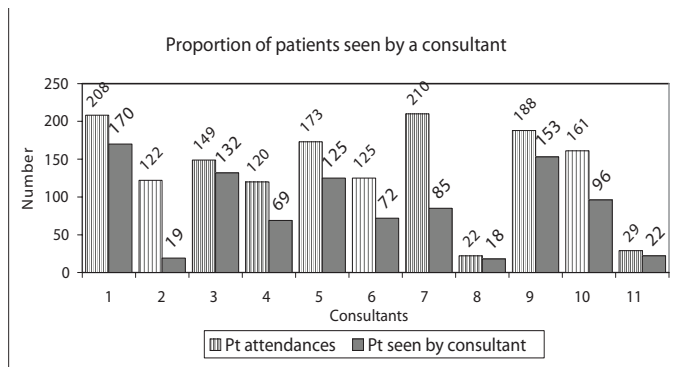


Figure 1: patient episodes actively seen by the supervising consultant.

Figure 1 shows individual consultant data for the number of patients actually seen by the consultants during trainee's outpatient clinics. Only consultants labelled "2" and "7" are below the audit standard.

CONCLUSIONS

The audit has demonstrated that the level of supervision of

trainees meets the locally derived standard throughout the region. Individual consultants and the trainees in two units are failing to meet the audit standard for the proportion of patients seen during treatment. This information has been discussed at regional audit and consultant trainer meetings to highlight the high standard throughout the region and suggest to individual trainers and trainees where levels are below the audit standard. The audit level of 50% was decided to reflect the stage of training of the trainees, all of which were in year three of the MOrth training programme. This level may need to be adjusted according to the experience of individual trainees. This audit highlights the need for both trainees and consultants to monitor the level of supervision provided.

This and other publications will help the development of national agreed guidelines for the speciality. Locally the audit has led to an agreed protocol of supervision from Consultant trainers. Following this agreement the audit will be repeated within the next training programme period.

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AUDIT OF REFERRAL AND MANAGEMENT OF OBSTRUCTIVE SLEEP APNOEA PATIENTS WITHIN THE ORTHODONTIC AND ORAL SURGERY DEPARTMENTS

Christian Day, Helen Knight - The Royal United Hospital Bath

INTRODUCTION

Obstructive Sleep Apnoea (OSA) is a potentially life threatening breathing disorder in which cessation of breathing occurs in the presence of inspiratory effort. It also has important psycho-social implications including excessive daytime tiredness and impaired cognition. Approximately 4% male and 2% of female 35 to 70 year olds are now recognised as suffering from OSA, with the condition becoming increasingly recognised by health care providers.

SIGN¹ recommend that any patient whom has a subjective measure of daytime sleepiness (i.e Epworth Sleepiness Score (ESS) >10) or sleepiness in dangerous situations, even with a normal ESS, in combination with symptoms associated with OSA be referred to a sleep service.

There is an increased recognition that patients with mild OSA, patients who are unable to tolerate continuous positive airway pressure (CPAP) devices, and snorers, may be successfully managed with a mandibular advancement splint (MAS). This has led to an increase in the referral pattern to the Orthodontic and Maxillofacial departments, and subsequent provision of MAS.

The resource implications to the departments are as follows: Each new patient requires a full clinical assessment, frequently supplemented by radiographic assessment of the dentition¹. Study casts are then taken for clinical records and for the MAS to be constructed. Construction is 'in-house' within the dental laboratory at an estimated cost of £50-75 per device, not including the cost of study and working models or adjustments. A further, follow-up clinic appointment(s) are then required to fit, adjust and occasionally remake these appliances as required.

AIMS OF AUDIT

1. Assess how many of those patients provided with MAS had

attended a dedicated sleep clinic with a confirmed diagnosis of OSA. Therefore, also to assess how many of these individuals did not attend any such clinic and had been referred directly for 'snoring devices'

2. Determine how many individuals having attended such a clinic have had OSA excluded and have been referred for 'snoring devices'

3. Determine the recorded patient's perceived success

¹ SIGN does not recommend radiographic imaging as part of the diagnosis of OSA. These images are to assess dental and periodontal health prior to appliance fabrication.

STANDARDS

1. All patients who are secondarily referred to the departments of Orthodontics and Oral surgery should have been previously formally assessed for the diagnosis of OSA
2. 70% Successful wear of appliances. This is an average of the reported compliance of MAS in the literature.

METHOD

A total of 48 patients were included in the study. These were obtained following a retrospective review of patients' notes who were referred for, and provided with, MAS during the first 6 months of 2004. All patients' notes were reviewed to determine the referral source for an indication of their presenting complaint. Further evidence was sought as an indication that the patient had attended a dedicated Sleep Clinic prior to referral. This involved assessing the referral letter and the clinical record taken at the time of initial appointment.

RESULTS

Referral Pattern

48 patients were included in the study. 25 patients were referred to the Orthodontic department and 23 patients were

referred to the Oral Surgery department. A review of the referral letters demonstrated that 25 patients had been referred with a presenting complaint of OSA. The remaining 23 patients had been referred for snoring appliances. Figure 1 demonstrates that approximately one third of patients had not been assessed on a dedicated sleep clinic prior to their referral.

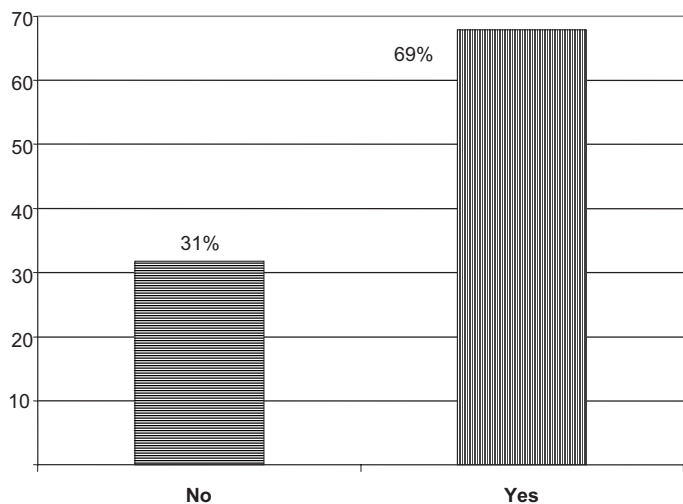


Figure 1. Was the Patient Assessed at a Sleep Clinic Before Referral?

Of the 33 patients who had been assessed on a sleep clinic, 25 patients were confirmed as having OSA. The remaining 8 patients had been referred for snoring devices.

Treatment Success

Figure 2 indicates the patient’s perceived success following the placement of the MAS. A success of ‘Yes’ or ‘No’ was allocated following assessment of the follow-up record(s). The category ‘Yes – not tiredness’ was a patient who had stopped snoring but symptoms of daytime tiredness continued. The category ‘Unknown’ includes those patients who were either not provided with a follow-up appointment (as indicated in the clinical notes) or failed to return, if an appointment was provided.

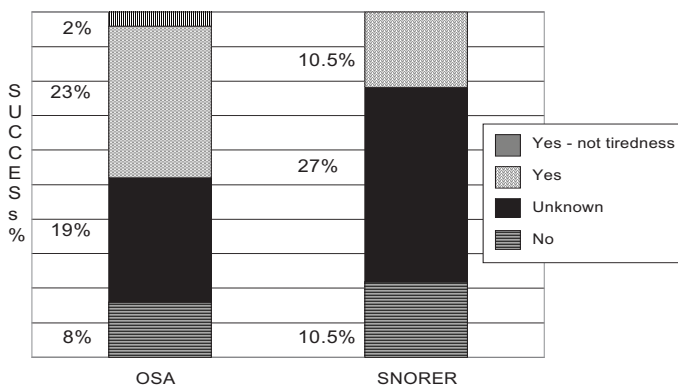


Figure 2. Overall Treatment Success (Improvement in Snoring and Tiredness)

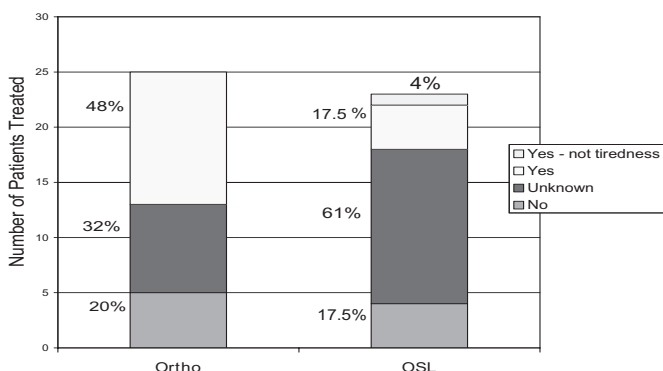


Figure 3. Treatment success by department

DISCUSSION

Associated with the SIGN guidance, there is an increased recognition amongst both clinicians and patients that MAS may be used in the management of OSA and snoring. This has led to an increase in the referral pattern and provision of MAS from 1 appliance in 1999 though to 90 in 2003. In the first 6 months of 2004, 55 appliances were provided. These figures simply relate to those patients whom have had appliances provided. It does not include those referrals where MAS were felt to be inappropriate or appointments not attended.

A concern of this audit has been the finding that only 35.5% of patients have been recorded as treatment success. This result indicates the patients perceived success in eliminating the presenting complaint, though in 1 case the daytime tiredness remained. No patient in this study has had a follow-up sleep study. The results, therefore, do not demonstrate the success of the MAS in reducing OSA. Of further concern are the 46% of patients who have no recorded success outcome. This figure comprises those patients’ who failed to attend for their review appointments or no record of the treatment success, or follow-up appointment, had been recorded in the hospital notes. As a result of this unknown figure it has not been possible to assess patients’ compliance with the wear of the MAS. 61% of Oral Surgery patients and 32% of Orthodontic patients account for this ‘unknown’ figure. We simply do not know if the splints have been successful.

The observation during clinics was that a significant number of these patients have either been shown not to have OSA, or indeed have not attended a dedicated Sleep Clinic for appropriate diagnosis. In essence these patients’ have been referred for snoring devices. The management of snoring with MAS is now well recognised, with a recent study² showing a significant reduction in snoring incidence and improved sleep quality. Though this complaint has undisputed socio-psychological implications, once OSA has been excluded on the Sleep Clinic the management of their snoring and provision of MAS could occur at the primary setting. Those patients with diagnosed OSA could then be treated within the secondary setting, reviewed and monitored appropriately.

CONCLUSIONS

A principle finding is that an improved method of patient follow-up needs to be developed as we simply do not know if the appliances provided were of any success in 46% of patients. This needs to be addressed to enable evaluation of treatment success.

This audit has demonstrated the provision of MAS within our departments failed to achieve either of the standards chosen. Indeed only two thirds of patients had been assessed with a sleep study, with 25 of these patients confirming the diagnosis of OSA. This is only 52% of referred patients. An issue is, therefore, should a secondary referral centre be providing MAS where there is no medical implication? If not who should provide this care and, as MAS are not on the Dental Practice Boards items of service, who would provide funding?

The issue of funding for the provision of splints in both the primary and secondary care settings needs to be addressed if patients are to receive appropriate management of their OSA or snoring.

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RADIOLOGY GUIDELINES: ARE WE FOLLOWING IR(ME)R 2000 FOR REPORTING RADIOGRAPHS?

SA Deacon, NE Atack, CN Mitchell, Musgrove Park Hospital, Taunton

INTRODUCTION

Following the IR(ME)R 2000 (Ionising Radiation Medical Exposure Regulations 2000)¹ the following statements have been made concerning radiographs in the clinical setting:

“The practitioner or referrer must enter a clinical evaluation of the radiograph(s) into the patient’s notes”²

Clinical evaluation does not necessarily have to be a full radiology report, but show that the radiograph has been evaluated and provide information for later audit. For example this may include the following:

- 1.The charting of caries
- 2.Findings relevant to prognosis or management
- 3.Nothing abnormal diagnosed³

AIMS

To establish if radiograph evaluation is being recorded for new and review patients where radiographs have been taken.

Subjects and Methods

Setting

Orthodontic Department, Musgrove Park Hospital, Taunton.

Design

Retrospective examination of a total of 50 sets of clinical notes where radiographs had been taken. Approximately equal numbers of both new and review / in-treatment were evaluated. The sample was selected from the departmental radiographic logbook during the period October and November 2003. The notes were examined by a senior clinician for documentation of a clinical evaluation in the following sections:

- Clinical notes
- Pro-forma examination sheets within the notes
- Letters sent to dental/ medical colleagues

AUDIT STANDARD

A clinician must enter a clinical evaluation of each exposure as stated in the IR(ME)R 2000 regulations. To be fully compliant with such a regulation, therefore implies a 100% standard is required.

Results

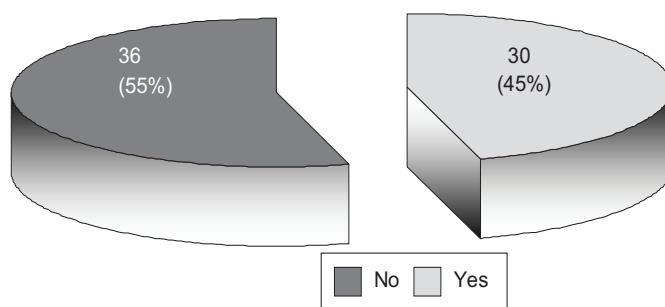


Figure 1. Total number of radiographs reported

Assessment of individual patients’ case notes within the sample revealed that 19 (38%) had no report recorded. Of the new patient records only 3 (11.5%) had no clinical evaluation recorded versus 15 (62.5%) for review / in treatment patients.

CONCLUSION

- The audit standard has not been met.
- This is more prevalent with review and in-treatment patients.

RECOMMENDATION

- To establish the use of a pro-forma stamp in the patients records when radiographs are taken. This will allow the evaluation to be entered directly into the clinical notes and will aid compliance with IR(ME)R 2000. Further evaluation of compliance by repeating this audit is planned for 6 months time. Long term this audit may be required to be repeated with subsequent changes in clinical staff. Furthermore the standard of completion of the pro-forma could be investigated once a high level of use is established.

Acknowledgements

Acknowledgement should be extended to the Orthodontic nursing team at Musgrove Park Hospital, Taunton for their help in this audit project.

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AUDIT OF ORTHODONTIC PATIENTS ATTENDING FOR ROUTINE TREATMENT

KL Walls, Gloucester

INTRODUCTION

Orthodontic patients do not always attend their usual dentist for examinations and routine treatment whilst they are undergoing orthodontic treatment. In one Community Dental Service in the South West of England a patient presented to the Senior Dental Officer, who was also providing his orthodontic treatment, with large cavities in his molar teeth. On investigation, it was found that this patient had not attended his usual dentist for routine examinations or treatment since before the commencement of his orthodontic treatment, which was some three years previously. Restorative treatment was provided and the orthodontic treatment was completed uneventfully. However, the issue of regular attendance by orthodontic patients with their usual dentist for the duration of

orthodontic treatment was highlighted. An audit of “routine” attendances by orthodontic patients was therefore performed in order to find out whether or not patients attended their usual dentist on a regular basis throughout their orthodontic treatment.

AIMS

To assess the numbers of orthodontic patients attending their usual dentist on a regular basis throughout orthodontic treatment in the Community Dental Service. Any patient who had been referred by a dentist from outside the service was excluded from this audit as it was not possible to ascertain the frequency of attendance with their usual dentist.

STANDARD

The standard for this audit was that 100% of orthodontic patients should have attended for routine dental examinations or treatment with their usual dentist within the previous twelve months.

PROCESS OF AUDIT

A selection of orthodontic patient records from two Community Dental Clinics were reviewed. Patients are generally referred to the Orthodontic Senior Dental Officer by dentists working in the same organisation. Record cards were checked for orthodontic patients undergoing active treatment and also those on the waiting list. The process was repeated 22 months later following implementation of changes.

From Clinic A, the record cards of 100 patients were checked - 50 undergoing active treatment and 50 from the waiting list. As there was no waiting list from Clinic B, record cards of current orthodontic patients were reviewed. For each record card the last routine dental appointment (treatment or examination) was noted. For the purposes of the audit it was accepted that routine appointments should have been kept within the previous twelve months.

RESULTS

	No. in sample	No. attended in last 6/12	Expected compliance (%)	Actual compliance
CLINIC A				
Active treatment	50	19	100	38%
Waiting list	50	24	100	48%
CLINIC B				
Active treatment	36	15	100	42%
Waiting list	-	-	-	-

Table 1

From the results it is clear that the majority of orthodontic patients were not attending their usual dentist for routine examinations or treatment.

DISCUSSION

This Community Dental Service serves a population of approximately 562000, has a patient base of approximately 22000 and does not benefit from computerised appointment or record-keeping. Patients are not routinely recalled for examinations unless there is a specific clinical need: because of the numbers involved the onus is on the patient to contact the clinics and make routine appointments themselves. The other major factor in the results of this audit is that orthodontic and routine record cards are filed separately in different filing cabinets, so simple cross-checking, that might have improved the compliance rates, was not done.

The National Institute for Clinical Excellence guidelines for dental recall¹ suggest that the longest interval between check ups for patients younger than 18 years should be twelve months. There are no specific guidelines for orthodontic patients, so as the majority of orthodontic patients are in this age group a 12 month recall interval was chosen.

IMPLEMENTATION OF CHANGES

In order to try and improve the compliance rates, orthodontic and routine record cards were subsequently filed together in plastic wallets. This was done immediately following the audit in Clinic A, but for reasons of physical space Clinic B

did not have its filing system updated until two years later. The intention of this was to facilitate cross-checking of the orthodontic notes with the routine notes at the time of their orthodontic appointments to enable patients to make routine examination appointments with their usual dentist. Although this creates a rather cumbersome procedure that a computerised system would negate, it is still an improvement.

RE-AUDIT

The audit was revisited 22 months later, and the results were as follows:

	No. in sample	No. attended in 6/12	Expected compliance (%)	Actual compliance
CLINIC A				
Active treatment	50	32	100	64%
Waiting list	-	-	-	-
CLINIC B				
Active treatment	39	17	100	44%
Waiting list	24	16	100	67%

Table 2

This time Clinic A did not have a waiting list for treatment, but Clinic B did. Despite the unchanged filing system in Clinic B there was still a small increase in compliance. This may simply have been due to the awareness of staff that patient attendance at routine appointments had become a problem. There has been an increase in compliance rates at both clinics, but there is still room for improvement.

CONCLUSIONS

This audit has highlighted both the need for a comprehensive system of recalling patients while they are undergoing orthodontic treatment and the inadequacies of a non-computerised Community Dental Service.

RECOMMENDATIONS

The most obvious way of improving patient attendance would be to have a computerised appointment system so that patients who are due for examinations can be reminded and given appointments. In a Community Dental Service the size of this one, however, the cost implications could be prohibitive. Potential hazards of orthodontic treatment are well documented², so when patients are being referred for orthodontic treatment they need to be reminded that routine appointments must also be kept for the duration of any orthodontic treatment. It is likely that in most General Dental Practices patients are recalled on a regular basis for examinations, rather than relying on the patients to remember for themselves. However, it is not uncommon for orthodontic patients to lapse with their usual practitioners during active treatment³, so any method of improving their attendance would be welcomed.

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AN AUDIT OF THE D.H.C. OF THE I.O.T.N.: POSTGRADUATE ORTHODONTIC CASES TREATED IN A TEACHING HOSPITAL

B.M. Mc Givern & M.T. Cobourne

INTRODUCTION

It is important that public healthcare resources are targeted towards priority groups with a high need for treatment. The Index of Orthodontic Treatment Need (I.O.T.N.) attempts to rank malocclusion in terms of the significance of various occlusal traits for an individual's dental health¹²³. It defines specific, distinct categories of treatment need, and includes a measure of function.

AIMS

The purpose of this audit was to review a consecutive sample of current postgraduate caseload and score these cases for the D.H.C. of the I.O.T.N. to ensure orthodontic trainees' cases are of sufficiently high treatment need.

MATERIALS AND METHODS

A series of 75 consecutive case notes and study models of patients currently under treatment by postgraduates in the Orthodontic Department of the GKT Dental Institute, Guy's Campus were reviewed and scored for the D.H.C. of the I.O.T.N. by a calibrated examiner. The locally agreed standard was that all cases treated by Orthodontic postgraduate trainees in the G.K.T. Dental Institute should score a D.H.C. of the I.O.T.N. of grade 3,4 or 5. The current standard does not involve grading the cases for the aesthetic component of I.O.T.N. Child patients were defined as those who had not yet attained their eighteenth birthday. Adults were defined as those patients who were 18 years and over.

RESULTS

The sample consisted of 17 adult subjects (mean age 28 yrs, 4 months; range 18 yrs, 6 months) 58 child subjects (mean age 12 yrs and 8 months; range 9 years, 1 month.)

(Table 1).

Table 1: D.H.C grades for sample

D.H.C.					% of sample
Grade 5	Great need	6	25	31	41.3%
Grade 4	Great need	8	28	36	48%
Grade 3	Moderate/borderline	3	5	8	10.7%
Grade 2	No/ slight need	0	0	0	0
Grade 1	No/ slight need	0	0	0	0
Total		17	58	75	

No grade 1 or 2 was scored for any of the sample.

Table 2: Sex distribution of cases and D.H.C. grades of the I.O.T.N. in the child sample of postgraduates' cases

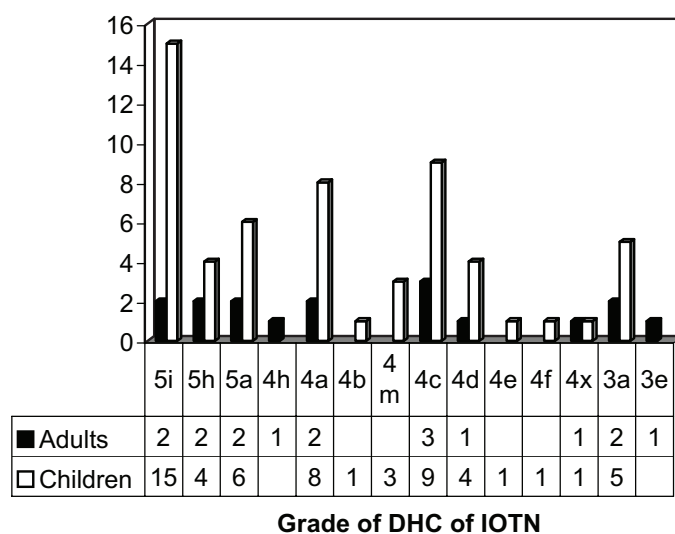
D.H.C.		Girls	Boys	Girls and Boys
Grade 5	Great need	14	11	25
Grade 4	Great need	13	15	28
Grade 3	Moderate/borderline	5	0	5
Grade 4	No/ slight need	0	0	0
Grade 5	No/ slight need	0	0	0
Total		32	26	58

Table 3. Sex distribution of cases and D.H.C. grades of the I.O.T.N. in the adult sample of postgraduates' cases.

D.H.C.		Women	Men	Women and Men
Grade 5	Great need	3	3	6
Grade 4	Great need	8	0	8
Grade 3	Moderate/borderline	2	1	3
Grade 2	No/ slight need	0	0	0
Grade 1	No/ slight need	0	0	0
Total		13	4	17

22% of the sample had impacted teeth, scoring a 5i (figure 1.). Therefore there is 100% compliance with the gold standard.

Figure 1. Range of DHC of IOTN for Adult and child patients



DISCUSSION

The sex distribution of orthodontic treatment need has been studied (Burden et al., 1994⁴, Ugar et al., 1998⁷). Burden et al. (1994) found that significantly more males than females were in need of orthodontic treatment. In our sample the sex distribution was approximately equal in the child sample (Table 2), and 75% female to 25% male in the adult sample (Table 3).

It has been observed that between 74% and 83.2% of a referred population had a great need for orthodontic treatment (Brook and Shaw (1989)², 74.4%, Richmond et al. (1994)⁵ 78%, Firestone et al. (1999)⁶ 81.6%. In our sample, 89.3% had a great need for treatment (grade 4 and 5) and 10.7% of cases had borderline need for treatment (Table 1). The decision to provide orthodontic treatment depends on a number of factors including health, motivation, cost, risk, duration, prognosis, and cannot be made solely on the basis of indices of treatment need. Cases that are determined through structured peer review to be clinically acceptable exceptions to meeting the agreed guidelines may be accepted for treatment in a hospital department.

CONCLUSION

This audit confirms that within the orthodontic department of the Guy's Campus G.K.T Dental Institute there is full compliance with the agreed standard for postgraduate training cases.

RECOMMENDATIONS

Medium term goals; Re-audit in a years time to monitor compliance with the standard.

Long term goals; Five yearly re-calibration in occlusal indices of clinicians responsible for accepting patients for treatment.

Departmental database of occlusal indices of treated cases to be utilised for audit, research and funding.

References

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AN AUDIT OF SEVERITY AND OUTCOME FOR SURGICAL - ORTHODONTIC CASES

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INTRODUCTION

A National Outcomes Audit was carried out recently to assess the severity and outcome of surgical orthodontic cases throughout the United Kingdom¹. Mean severity and outcome scores were calculated, which could be used as standards to compare surgical –orthodontic cases treated within individual centres². With patients more dentally aware, continued pressure on length of hospital waiting lists and limitations of both the number of Consultants and changes to the consultant contract, it is essential that the relevant cases are being treated and that the treatment provided is effective and beneficial.

The mean severity score in the national audit was 3.8 with a standard deviation of 1.3 and a standard for this audit was set at a mean severity score of 4 or less. The mean outcome score in the national audit was 5.4 with a standard deviation of 1.3 and a standard of 5 or more was set for this audit.

AUDIT METHOD

The study was a retrospective audit of surgical-orthodontic cases treated during the last 5 years in Altnagelvin Area Hospital. Pre-treatment cephalometric radiographs (taken at age 18 or older, and prior to any orthodontic treatment - severity score) and post-treatment cephalometric radiographs (taken at least one year post-surgery – outcome score) were analysed.

RESULTS

Thirty-five cases were treated during this period and of these fifteen had the necessary radiographs and notes available for inclusion in the study. Distribution of the Altnagelvin severity and outcome scores and comparison with the national audit are shown in Tables 2 and 3 and Figures 1 and 2.

Table 2. Distribution of severity scores

Severity Score	Percentage of cases in National Audit	Percentage of cases in Altnagelvin Audit
1 or Less	3%	13%
2 or Less	16%	27%
3 or Less	41%	60%
4 or Less	69%	87%
5 or Less	92%	100%

Table 3. Distribution of outcome scores

Outcome Score	Percentage of Cases in National audit	Percentage of cases in AAH audit
7	20%	13%
6 or above	52%	67%
5 or above	80%	87%
4 or above	91%	100%

AIMS

- To compare the severity and outcome of surgical-orthodontic cases treated in Altnagelvin Area Hospital with those treated throughout the UK.

STANDARD

The findings of the National Outcomes Audit for surgical-orthodontic cases were used as the standard for this audit project². These are based on 7 key cephalometric parameters traced on radiographs before orthodontic treatment and 1 year post debond.

- relationship of the maxilla to mandible, ANB
- relationship of mandible to skull, SNB
- vertical facial proportions, LFH%
- dentoalveolar relationship (overjet, overbite, UI to Max plane)
- soft tissue profile, the Holdaway angle,

An acceptable range, derived from the national audit¹, is used to score each parameter. From these measurements a severity and outcome score is calculated for each case. Severity scores range from 0-7, with lower scores representing more severe cases. Outcome scores also range from 0-7, but with higher scores representing a better outcome. (see Table 1)

Table 1 Format used to analyse pre and post treatment cephalometric radiographs

Measurement	Acceptable Range	Within range? Yes/no
ANB	-1° to 7°	
SNB	72° to 84°	
LFH%	51% to 59%	
Overjet	1.3mm to 5.3mm	
Overbite	0.8mm to 6.8mm	
UI/Mx	97° to 121°	
Holdaway	7° to 14°	
Severity score = No. of Yes grades (lower scores represent more severe cases)		
Outcome score = No. of Yes grades (higher scores represent better outcomes)		

Figure 1. Severity Score

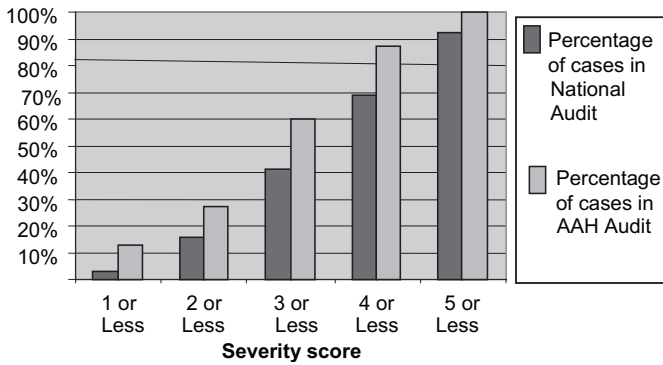


Figure 2. Outcome Score

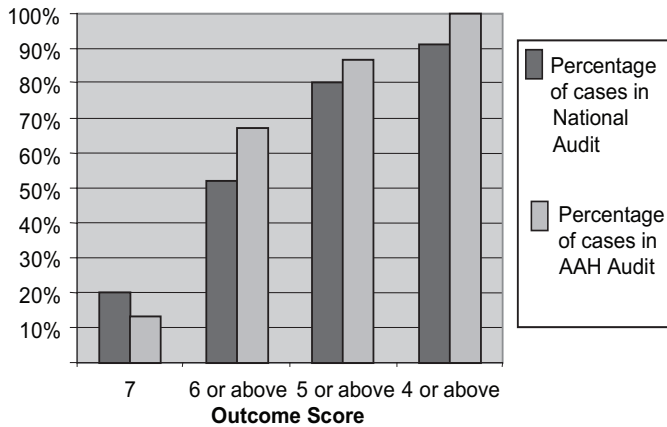


Table 4 shows the average severity and outcome scores with standard deviations.

A t-test to assess differences in means showed both were significant

Table 4. Comparison of mean scores.

	National Audit Findings	Altnagelvin Findings	T-test, p value		
Mean Severity Score	3.8 (s.d. 1.3)	3.1 (s.d. 1.3)	P>0.01		
Mean Outcome Score	5.4 (s.d. 1.3)	5.7 (s.d.0.9)	P>0.05		
Type of score	Score	Percentage of Cases in National audit	Percentage of cases in AAH audit	Chi-squared value	P-value
Severity	4 or Less	69%	87%	8.42	<0.01
Outcome	5 or above	80%	87%	1.32	<0.25

Table 5. Statistical comparison of severity and outcome results.

Type of score	Score	Percentage of Cases in National audit	Percentage of cases in AAH audit	Chi-squared value	P-value
Severity	4 or Less	69%	87%	8.42	<0.01
Outcome	5 or above	80%	87%	1.32	<0.25

The mean severity score of 4 or less nationally was 69% compared with 87% for Altnagelvin Area Hospital, and the mean outcome score of 5 or above was 80% nationally compared with 87% for Altnagelvin Area Hospital. A Chi-squared test indicates that in the 15 cases analysed, cases

treated in Altnagelvin Area Hospital were significantly more severe than the national average and the outcome slightly better, although the latter is not significant at 5% level. (see Table 5)

DISCUSSION/RECOMMENDATIONS

The results from Altnagelvin Area Hospital compared favourably with those treated in the national audit.

A significant finding was that only 43% of cases had the necessary records and radiographs available for inclusion in this audit project. This highlights a number of areas that merit further discussion and auditing.

1. Why were the radiographs and notes not available? Was it because they were lost in filing? Were they not taken at appropriate times? Did the patient fail to cooperate? Are clinicians more likely to collect final records in cases they are pleased with their result than in cases that did not go so well?
2. Exclusion of the cases that failed to attend for assessment one year post-operatively may have skewed the results, as this group may have had less/more favourable treatment outcomes.
3. How effective is the Altnagelvin proforma incorporated into each surgical orthodontic patient's notes? (Proforma methodology allows the correct data collection at various stages throughout a course of treatment.)
4. The lack of notes and radiographs highlights the difficulty of carrying out effective retrospective audit and quality assurance.

In light of all this, it may be of value in the future to develop an electronic proforma including the severity and outcome score of each surgical-orthodontic case as the cephalometric radiograph is digitized. In doing so the effectiveness of surgical-orthodontic treatment within the department could be monitored and assessed prospectively.

CONCLUSIONS/PLAN

- This audit has demonstrated that cases chosen for surgical-orthodontic treatment in Altnagelvin Area Hospital are of the appropriate severity when compared with national standards.
- It has also shown that the outcome of surgical-orthodontic treatment in Altnagelvin is satisfactory when compared to national figures
- It should be remembered that a low percentage of cases had sufficient data for inclusion in the study and this has limitations on any inference on the unit's performance.
- Development of an electronic prospective assessment of cases would be helpful.

References

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AN AUDIT TO ASSESS PATIENT SATISFACTION WITH ORTHODONTIC TREATMENT RECEIVED WITHIN A HOSPITAL ORTHODONTIC DEPARTMENT

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INTRODUCTION

An important element of clinical governance is to establish the patients' experience of the treatment they receive and to use this information to promote a high level of patient satisfaction. Patients undergoing orthodontic treatment attend for multiple appointments over many months and there is ample opportunity to obtain feedback of the service being provided.

AIMS AND OBJECTIVES

- To assess patient satisfaction with the care received during their orthodontic treatment
- To highlight any areas of dissatisfaction
- To institute changes in areas of weakness
- To re-audit

STANDARDS

Richmond proposed 100% satisfaction as the standard for patient satisfaction in the BOS Orthodontic Audit Recipe Book (2000)¹. McCance (2003)² set a standard of 80% of patients satisfied with orthodontic treatment in an audit carried out in Specialist Orthodontic Practice. For the purposes of this audit 90% patient satisfaction was agreed as an acceptable standard, in line with Kindelan (2000)³.

METHODOLOGY

The audit sample consisted of 100 consecutive patients undergoing active orthodontic treatment within a Hospital Orthodontic Department over a six week period. Each patient received a questionnaire devised in conjunction with the Hospital Research and Development Unit to highlight the following areas of care: orthodontist-patient relationship; technical quality of care; access to treatment; waiting times; facilities; continuity of care; and surgery atmosphere. The patient filled in the questionnaire in the waiting room and returned it to a collection point in order to maintain anonymity.

RESULTS

All 100 patients returned the questionnaire and 98 were considered valid (the remaining two questionnaires had been filled out incorrectly), representing a 98% response rate. Independent analysis of the data was carried out.

The results are presented in the table.

CONCLUSIONS

- This audit addressed an important component of clinical governance by monitoring one aspect of the delivery of quality standards.
- Patient satisfaction met or exceeded the audit standard in areas relating to the orthodontist-patient relationship, technical quality of care, facilities, continuity of care and surgery atmosphere.
- Patients were dissatisfied and the audit standard was not met in the responses to questions relating to access and waiting times.
- 95% of patients reported that they were satisfied with the overall orthodontic service.

Table 1. Responses to questionnaire

Question	Percentage responding 'always/almost always/a lot of the time'	Percentage responding 'some of the time/almost never/never'	Audit standard achieved
Orthodontist-Patient Relationship			
My orthodontist treats me with respect	96%	4%	Yes
My orthodontist explains what he/she is doing	93%	7%	Yes
I have confidence in my orthodontist	91%	9%	Yes
My orthodontist is friendly	96%	4%	Yes
My orthodontist is caring	95%	5%	Yes
My orthodontist provides me with the information I need	94%	6%	Yes
Technical Quality of Care			
My orthodontist is thorough	95%	5%	Yes
I have complete confidence in my orthodontist	94%	6%	Yes
I believe the treatment I receive is of a high standard	98%	2%	Yes
Access			
I can arrange an appointment when it suits me	76%	14%	No
I find it easy to contact my orthodontist to make an appointment	60%	40%	No
Patient Waiting Time			
I see my orthodontist on time or within 10 minutes	71%	29%	No
I am happy waiting even if the clinic is running late	60%	40%	No
The staff keep me informed of any delays	56%	44%	No
I am certain they know when I have arrived	87%	13%	No
Facilities			
The receptionist is friendly	92%	8%	Yes
The waiting room is clean and neat	98%	2%	Yes
The waiting room has a friendly atmosphere	81%	19%	No
Continuity of Care			
I see the same orthodontist each time I come	93%	7%	Yes
The orthodontist has my notes and models available	98%	2%	Yes
I believe my treatment is going well	96%	4%	Yes
Surgery Atmosphere			
My orthodontist and staff work well together	100%	0	Yes
The surgery is neat and clean	100%	0	Yes
The surgery has all the equipment necessary for my	99%	1%	Yes

RECOMMENDATIONS

- The dental nurses to inform patients in the waiting room of any delays to the clinics.
- Patients to be given a named dental nurse to contact in the event that they need to change an appointment.
- A notice to be placed in the waiting room to explain that many different clinics run at any one time.
- Re-audit to be carried out in 12 months time.

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AUDIT OF 109 REFERRALS TO AN ORTHODONTIC DEPARTMENT TO ASSESS IF THEY WERE APPROPRIATE

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INTRODUCTION

The majority of patients who are seen by an orthodontist are referred by their General Dental Practitioner (G.D.P.). The main purpose of the referral is to obtain a diagnosis and possible treatment options. Many G.D.P.s refer for advice others refer hoping the orthodontist will undertake the treatment. Inappropriate referrals or the G.D.P. misusing the orthodontic service only leads to increased waiting list times.

AIMS

To assess if new referrals to the Orthodontic Department at Queens Hospital are appropriate.

AUDIT PROCESS

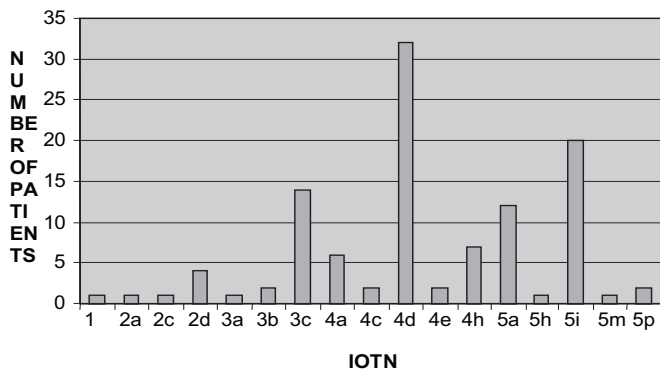
All new patients referred to the orthodontic department were assessed by the same orthodontic consultant over a period of 8 weeks. 109 consecutive new patients were included in the audit. The audit data was recorded on a pre-designed data sheet. Appropriate referrals were deemed to be,

- Patients who wanted orthodontic treatment or advice.
- Patients who are at an appropriate age to receive this treatment or advice.
- Patients who have satisfactory oral hygiene and level of dental care for proposed treatment or advice.

RESULTS

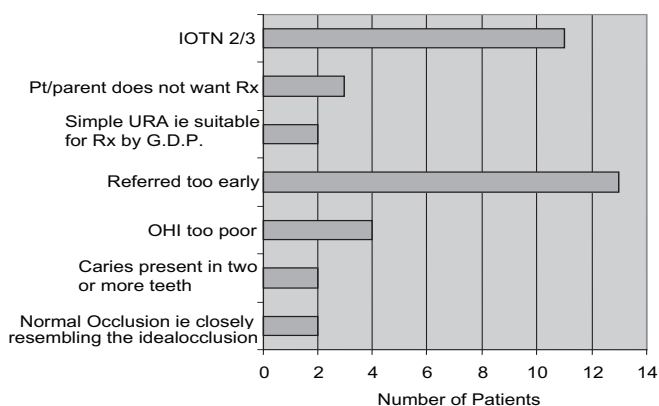
The age of patients referred to the department ranged from 6 years to 52 years. The average age was 13 years and 6 months. There were 41 males and 68 females in the group.

Figure 1. IOTN of Patients referred



85 of the 109 referrals received by the department were IOTN 4 or 5 (See figure 1). 72 of the referrals received were appropriate. The most frequent reason for inappropriate referrals was that the patient was referred too early (13 patients). See figure 2 for other reasons for inappropriate referrals.

Figure 2. Reasons for inappropriate referrals



58 patients were placed on the waiting list for treatment within the hospital. From the 51 patients who were not placed on the waiting list

- 9 were referred to Specialist Practitioners
- 42 were referred back to the G.D.P.

DISCUSSION

An IOTN score is given to all patients at the first visit. Unfortunately due to the demands on the Orthodontic Department at Queens Hospital only patients with an IOTN score of 4 and 5 can be treated within the hospital. It is recommended that those patients with IOTN 2 or 3 are treated by Specialist Orthodontic Practitioners (if treatment is needed). This is a policy adopted by all Consultants in the West Midlands Deanery. It is perhaps unreasonable to expect G.D.P.'s to be able to grade IOTN themselves but they should be able to recognise the majority of very mild cases i.e. IOTN 1 and 2 and refer these to specialist practitioners for advice. The use of IOTN to identify if treatment is necessary was recommended in the "Modernising NHS Dentistry" proposals¹. In a recent letter to the British Orthodontic Journal² Chris Hinman from the Dental Practice Board said "it is highly likely that it (IOTN) will be introduced as part of the new PDS contract with a minimum requirement of IOTN 3 and Aesthetic component of 6 to qualify for treatment" (on the NHS).

The main reason for inappropriate referrals highlighted by this audit was that the patient was referred too early (13 patients). This may be because G.D.P.'s are hoping to get the patient into the hospital system to avoid the waiting list. Although it is often apparent at an early age that a child may need orthodontic treatment referring early only serves to increase waiting list times.

Two patients were referred for simple URA's i.e. to push an incisor over the bite. G.D.P.s would be expected to do this without referring for treatment or advice. Training is given locally to any G.D.P. who requests it regarding this specific treatment.

It is recognised by the department that some G.D.P.s may wish to refer patients for advice and simple removable appliance prescriptions, these patients will continue to be seen on new patient clinics.

IMPLEMENTATION OF FINDINGS

Although all new referrals will be seen on the new patient clinic they will not be placed on the hospital waiting list for treatment unless they are suitable for orthodontic treatment at this visit. Patients who are likely to need orthodontic treatment but who have been referred too early will be referred back to the G.D.P and asked to be re-referred at the appropriate time. It is hoped by writing to the G.D.P.s to tell them the reason the patient has not been placed on the waiting list that this will re-educate the G.D.P. and prevent further unnecessary referrals. The audit will be repeated in 1 year.

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AUDIT OF PATIENT SATISFACTION WITH THE PROVISION OF ORTHODONTIC CARE AT THE ROTHERHAM GENERAL HOSPITAL

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INTRODUCTION

It is important for any health care provider to ensure that the treatment they offer satisfies the patients they serve. This satisfaction is not only concerned with the result of the treatment, but also includes the method of delivery of that care.

Following the introduction of clinical governance in 1995, there has been an increasing emphasis and greater attention placed on the patient's experience of healthcare. Patient satisfaction may be defined as "a patient's attitude towards health care provided or received".

AIMS

The purpose of this audit was to assess the patient's and parent's satisfaction with

- The clinical setting;
- The manner in which they received treatment;
- The course of the orthodontic treatment that was provided.

STANDARD

The "Gold standard" used in this investigation was all patients undergoing treatment should have no less than 80% satisfaction and happy with all aspects of the service provided.

MATERIALS AND METHOD

A questionnaire was designed relating to important aspects in the delivery of treatment. 50 questionnaires were distributed consecutively to the patients and / or parents who completed their active orthodontic treatment by the Consultant and the FTTA at Rotherham General Hospital. This was carried out between January and October 2004.

It is assumed all parents and patients were honest in their responses. To encourage this, parents and patients were advised that any results would be kept anonymous. To ensure a 100% response rate, all questionnaires were collected from the patients prior to them leaving the department.

Each questionnaire consisted of 10 questions. The participants were asked to tick the appropriate columns for questions 1-7. The remaining 3 questions were open-ended and the patients were asked to write their answers and comments.

RESULTS

All 50 questionnaires were completed and returned.

The results are as follows:

QUESTIONS ASKED	RESULTS		
	Yes	No	Don't know
1. Did you receive information leaflets before treatment started?	36 (72%)	4 (8%)	10 (20%)
2. Did you find the information on diet and oral hygiene instruction helpful and easy to follow?	44 (88%)	3 (6%)	3 (6%)
3. Before treatment started, did you fully understand that you would have to wear retainers at the end of treatment as instructed by the Orthodontist?	46 (92%)	4 (8%)	0

QUESTIONS ASKED	RESULTS				
	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	
4. Throughout your treatment, were you satisfied with the information given to you at each visit?	37 (74%)	13 (26%)	0	0	
5. How satisfied were you with your treatment?	47 (94%)	3 (6%)	0	0	
6. How satisfied were you with the result?	48 (96%)	2 (4%)	0	0	
QUESTIONS ASKED	RESULTS				
	Always	Often	Sometimes	Never	Don't know
7. At each visit did you feel able to discuss your treatment?	38 (76%)	9 (18%)	3 (6%)	0	0

Question 8. Is there anything else you would have liked to have known before starting treatment?

Question 9. Would you have any advice to patients about to start treatment?

Question 10. Are there any reasonable suggestions that you feel would improve our service?

CONCLUSIONS

Overall, the vast majority of patient's showed greater than 90% satisfaction with the orthodontic care received. Disappointingly, only 72% of the patients stated they received a copy of the information leaflet, which is below the gold standard. 88% thought the information on diet and oral hygiene instruction was easy to follow and 76% of the patients felt they were able to discuss their treatment at each visit.

DISCUSSION AND RECOMMENDATIONS

Following the new patient clinic, all patients are given an information leaflet on orthodontic treatment. Having read and understood it, they are advised to return the signed form confirming that they would like their names to be placed on the treatment waiting list. Once they commence treatment, further information leaflets are given with relevance to the specific orthodontic appliance that is being used. The time difference between the first and second set of information leaflets could be no less than 18 months to 2 years, i.e. treatment waiting list before commencing of active treatment. This could have given rise to the low percentage of "yes" response in Q1. Since there is a fairly long interval of a minimum of 18 months, the recommendation is to re-issue the original leaflet (as regards orthodontic treatment) to all patients when they came off the waiting list, i.e. at the records appointment.

Though greater than 90% of patients were very satisfied with the treatment result (Q5 and Q6), only 74 – 76% of the patients (Q4 and Q7) were very satisfied with the information they were given or felt that they were always able to discuss their treatment at each visit. In future clinical practice, therefore, time must be incorporated into each visit to discuss progress with the patient and parent, and to allow questions to be asked.

Though general comments by patients were positive and complimentary, there is no room for complacency. Changes in clinical practice have been incorporated, and the audit will be repeated in 12 – 18 months time.

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COMPARATIVE AUDIT OF NEW PATIENT CLINIC ATTENDANCE RATES

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INTRODUCTION

Orthodontic patients who fail their initial "consultation" appointment negatively affect both clinical and administrative resources of an orthodontic practice/department¹. The reported failure rates for orthodontic patients vary between 10-23% with "new" patient attendance failures tending to exceed those of patients already undergoing active orthodontic treatment^{2,3}.

AIMS

- To assess and compare the incidence of failed appointments involving orthodontic patients attending "new patient" clinics within a dental teaching hospital, a district general hospital and at a local specialist orthodontic practice
- To determine the need to implement changes if attendance rates fall short of the suggested "gold standard"

STANDARDS

No published data is available with regard to the attendance rates of new patients at their initial appointment in specialist orthodontic practice. The failure rate for new patients referred to a large dental teaching hospital has been previously recorded at 23%².

Failure rates for all orthodontic patients at Leeds Dental Institute has been previously recorded at 10%³. "True" emergencies would seem to account for less than 1% of all failed orthodontic appointments⁴. A "gold standard" of 5% failed new patient appointments (without prior notice of cancellation) was agreed for this audit project.

METHOD

Data was prospectively collected during a 3-month period at Leeds Dental Hospital (LDI), Seacroft Hospital, (SCH) and at a local specialist orthodontic practice (SOP). The recorded data was exclusive to new patients failing their initial consultation appointment. All new patient clinics were scheduled on weekdays between 9am and 5pm.

RESULTS

Table 1. Failure rates of patients attending new patient clinics

Location	Nos. of Scheduled appointments	Nos. of Failed appointments	Overall Failure Rate (%)
LDI	127	20	15.7
SCH	70	11	15.7
SOP	574	9	1.6

The specialist orthodontic practice has achieved the "gold standard" set for this audit. Failure rates were found to be similar (15.7%) for both the Leeds Dental Institute and Seacroft Hospital. As a result, both of these hospital departments failed to achieve the "gold standard" set and remedial action is indicated.

DISCUSSION

The very acceptable low failure rates (<2%) experienced within the SOP suggest that this practice has an effective new patient management policy. Failure rates for both the LDI and SCH are unacceptable. Possible administration reasons for the differences in failure rate found between the 3 centers warrants closer examination. Currently, patients referred to the LDI receive a letter confirming the details of their first appointment within 6 weeks of the hospital receiving the initial referral letter. Patients referred to SCH routinely receive an initial "standard" letter from the department that contains a tear-off slip for the patient to check/amend their personal details and confirm that they wish to receive a consultation appointment.

A stamped addressed envelope is supplied. The patient only receives confirmation of their appointment date once the tear-off slip has been completed and returned. This can lead to some delay in arranging the initial appointment but all new patients are seen within 13 weeks.

Patients referred to this particular specialist orthodontic practice will routinely receive an initial telephone call from the practice. Patients are able to schedule a suitable appointment time directly with the practice receptionist. Once the appointment has been scheduled, a computer-generated letter is sent to the patient confirming the details of their appointment. This letter also indicates to the patient that a charge will be made for any missed appointments. Patients can expect to be scheduled on to a new patient clinic within a 6-8 week period.

This audit demonstrates that all clinicians need to be pro-active in educating patients and parents about the consequences of failed appointments. On this aspect of patient administration, most hospital departments have a great deal to learn from our specialist and general practice colleagues e.g. charging patients for missed appointments, patient posters/flyers informing them of monthly appointment failure rates, etc.

Soon after completing this initial audit, a "partial-booking" system was introduced at SCH. The concept of "partial-booking" requires the referred patient to take responsibility for contacting the appointment booking office. This enables patients to arrange a more suitable appointment date and time. The written details of the appointment are then sent out to the patient by post. Following the introduction of the implemented changes at SCH a re-audit was carried out. The introduction of "partial booking" has resulted in a significant reduction of failed appointments for patients attending new patient clinics at SCH. The current failure rate (April 2004 – current) now stands at 4.9% - a drop of >10% from the initial audit. The orthodontic unit at SCH is now achieving the original "gold standard" set for this audit. This system of booking newly referred patients is now also being adopted at Leeds Dental Institute.

IMPLEMENTATION OF FINDINGS

In the near future, a new national appointment booking system will be available to all patients requiring an initial outpatient appointment. "Choose and Book" (C&B) will enable patients to choose a convenient place, date and time for their initial appointment. This planned system is due to being fully operational by the end of 2005 and patients can either book their appointment electronically or by telephone⁵. It is then planned to re-introduce the audit process to measure the effect of C&B.

Data of failed orthodontic appointments are continuously being recorded at both the LDI and SCH. The current data, however, does not discriminate between patients attending routine treatment appointments and those attending "retention" review or more long-term review appointments. It is planned to investigate the effect of a "partial booking" process on attendance rates for review patients as this is felt to be another source of poor attendance rates.

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CARIES DETECTION IN ORTHODONTIC PATIENTS PRIOR TO COMMENCING ORTHODONTIC CARE

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INTRODUCTION

It is accepted good practice that patients should not begin orthodontic treatment if they have uncontrolled dental disease. Orthodontic treatment planning will normally be undertaken with the assistance of radiographic findings¹. However bitewing radiographs are not routinely used in the orthodontic treatment planning process, usually being the domain of the general dental practitioner to aid in caries diagnosis and treatment. Evidence suggests that bitewing radiography has a greater sensitivity in caries diagnosis than tomographic radiography^{2,3,4}.

It is recommended that bitewing radiographs be taken biannually for low risk patients in the permanent dentition and more frequently for those in the mixed dentition or at increased risk of caries^{5,6}. IR(ME)R 2000 guidelines highlight that justification of exposure is required for each individual. Patients at high risk of caries should have bitewings taken, but biannual radiographs may be excessive for those at low risk. For each individual the risk/benefits equation of radiographs should therefore be considered and ALARP (as low as reasonably possible) principles applied.

AIMS

1. To investigate, prospectively, the incidence of caries in orthodontic patients taken off the orthodontic treatment waiting list prior to immediate commencement at the Charles Clifford Dental Hospital.
2. To compare the number of lesions detected on bitewing radiographs with detection rates using dental-pantomograms (DPT).

Our objective was to establish whether bitewing radiographs were taken by general dental practitioners during the period that the patient was on the orthodontic waiting list and to consider whether bitewings should be taken routinely in the orthodontic department as part of the treatment planning process.

STANDARDS

Our standard is that patients attending the orthodontic department should have all active carious lesions diagnosed and managed prior to commencing orthodontic treatment.

MATERIALS & METHODS

Orthodontic patients in the department undergo radiographic examination prior to commencement of orthodontic treatment in accordance with the BOS radiographic guidelines.

Bitewings are rarely taken in addition to a DPT.

A pilot audit of ten patients, taken from the treatment waiting list, examined additionally with bitewing radiographs found a caries incidence in the sample of 60%.

Further to this, pilot data collection forms for patients taken off the treatment waiting list from April 2004 – July 2004 were collected. Patients were included in the audit if they were in the full permanent dentition and were not over 18 years of age. 59 patients (29 females and 30 males) were audited. These patients had all been on the orthodontic treatment waiting

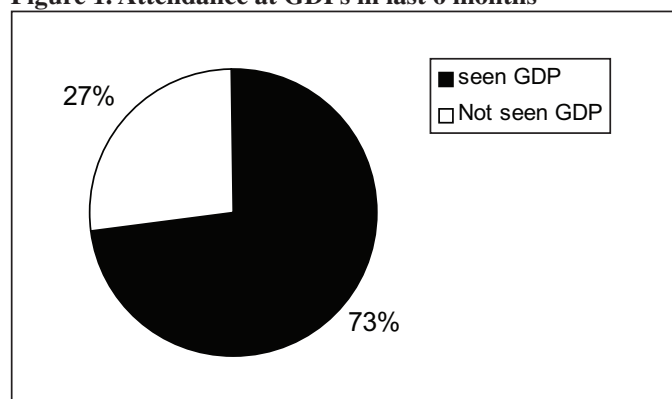
list for a mean period of 2.2 years. Patients were asked when they had last seen their dentist and when radiographs had last been taken in the surgery. For any patient reporting recent radiographs at their dentists, the practice was contacted and the radiographs sent as appropriate. In addition to a visual examination, the attending consultant Orthodontist then examined for caries, initially using a DPT and then bitewing radiographs.

RESULTS

Of the 59 patients, 43 claimed to have seen their dentist in the last six months (figure 1).

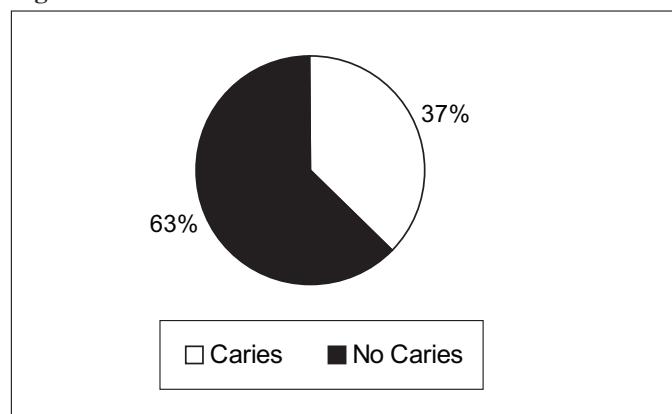
Only 12 of the 59 patients could recall ever having radiographs taken by their dentist. Seven of these 12 received their regular dental care at the dental hospital in the paediatric dentistry department and the radiographs were available for these. The remaining 5 were requested from their referring practitioners, these were all DPT's taken on average 18 months previously.

Figure 1. Attendance at GDPs in last 6 months



Twenty two of the 59 patients (37%) were found to have detectable carious lesions requiring attention before orthodontic treatment commenced (Figure 2). Surprisingly, only 11 of these patients (18.6%) showed lesions on their DPT radiograph. Fifty percent of the carious lesions were therefore only detectable using bitewing radiographs.

Figure 2. Patients with Detectable Caries



There was no difference in the caries incidence of those patients seen by their dentist in the previous six months (16/43= 37%) to those who had not attended recently (6/16 = 37%).

DISCUSSION

Dental caries was found in an unexpectedly high number

(37%) of patients referred for orthodontic treatment. Half of these patients would potentially have not been diagnosed appropriately if a bitewing examination had not been undertaken.

This audit confirms available evidence that panoramic radiography is not as effective at detecting caries as bitewing radiographs⁸. Douglas et al⁹ studied the sensitivity and specificity of radiography in caries detection. The sensitivity represents the proportion carious teeth identified as being diseased by the radiograph. They found 60-64% sensitivity for premolar and molar caries in Bitewings, but only 13-24% sensitivity in Panoramic radiographs. Specificity is the proportion of non-carious teeth so identified by the radiograph. They found over 95% specificity for both types of radiograph. Our results suggest that a recent set of bitewing radiographs should be available as part of the planning process.

Ideally the referring practitioner could provide a recent set of bitewings to assist diagnosis and treatment planning. Whilst dentists are obliged to monitor for dental caries under their terms of service, our audit suggests that bitewings are not taken routinely or as frequently as current recommendations would suggest and caries remains undiagnosed.

This may be due to reluctance on the part of practitioners to expose child patients to irradiation. There may also be financial disadvantages for the general dental practitioner under the present remuneration system.

Conclusions

This audit was presented to the departmental and regional audit meetings. There was agreement that bitewing radiographs should be available to enable effective caries detection. The audit is to be extended region wide.

Plan

The department agreed that bitewings would be taken for all

patients by the hospital radiographers, prior to commencing orthodontic treatment, unless there were either medical contraindications or if recent bite wings of appropriate quality were available. All patients seen on new patient clinics and are now sent a copy of the correspondence to their referring practitioner. For those placed on our lengthy treatment waiting list the importance of regular dental review and caries prevention is stressed. We will re-audit in one year all patients starting treatment in the department to establish the detection of carious lesions and that treating clinicians are complying with the departmental guidelines to take bitewings at start of care.

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BONDED RETAINER FAILURE RATES - REVISITED

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INTRODUCTION

A previous audit showed high failure rates for bonded multistrand retainers fitted in our departments before 2002¹. Subsequently we discussed these results with the clinicians involved and refined our technique with the introduction of an occlusal acrylic positioner to aid placement during direct bonding of the retainer².

AIMS

Re-evaluation of the failure rates of bonded multistrand retainers for individual clinicians and at a combined departmental level.

STANDARD

Previous reports show a wide variation of failure rates (5.9-55%) for bonded retainers³⁻⁶. After discussions at our regional orthodontic audit group meeting an overall retainer failure rate of 10 percent and an individual bond failure rate of 10 percent during the first year of retention was confirmed as acceptable.

AUDIT PROCESS

We retrospectively investigated the records for all patients from both hospitals who had been fitted with multistrand retainers at the end of orthodontic treatment during 2002 and 2003. The patients were identified from the databases of

our laboratories where the retainers were constructed. Total (complete loss of wire) or partial (fracture of some bonds or wire) failures were recorded in the 12 month follow-up period before discharge. Retainers were constructed as before¹ (0.0215" Penta-One wire bonded with Transbond LR composite). Most retainers (96%) were 2-2 in type (the initial audit showed 61% more breakages with 3-3 design) and 60 percent were placed with the aid of a positioner². All the included teeth were bonded to the retainer wire. Clinical procedures included lingual enamel cleaning with a round tungsten bur running at slow speed, pumicing, a 30 second etch, isolation with labial and lingual cotton rolls, thorough drying, application and curing of Transbond XT primer before placing and bonding the wire.

Seven operators participated in the audit. Three (S) were on the UK orthodontic specialist list (consultant, FTTA and community specialist). The other four (C) were general dentists who were training as clinical assistants.

RESULTS

(previous audit results shown in brackets)

Altogether 355 retainers were analysed in 267 patients (Table 1).

Operator	Number retainers placed	Patients with a retainer failure %	Retainer first # rate %	Retainer overall # rate %	Bond failure rate %
S1	161	5.6	4.3	4.3	2.2
S2	16	28.5	37.5	37.5	26.6
S3	34	35.5	27.8	29.4	13.3
C1	35	38.5	28.5	37.1	23.9
C2	30	15.8	10.0	10.0	6.7
C3	53	37.5	30.2	35.8	14.6
C4	26	52.4	29.7	42.3	20.7
Total	355				
Mean		22.6	18.0	19.4	10.5

Table 1. Bonded retainer failures (S = specialist; C = clinical assistant)t

The retainer first-time failure rate was 18.0 percent (30.0%), and when repeat failures were included the overall rate was 19.4 percent (37%). Partial fracture accounted for 63 percent and total retainer loss for 37 percent (68%; 32%). The failure rate for individual bonds was 10.5 percent (23%). The maxillary and mandibular retainer failure rates were both 18 percent (30%; 31%). The failure rate when positioners had been used was 9.6 percent but this increased to 28.3 percent for retainers placed without. Of the total number of patients, 22.6 percent experienced a breakage (35.0%).

Only two operators met the standards (Figures 1 and 2). Of the five who worked in the departments during both audits three showed reduced and one increased failure rates. The combined departmental results failed to meet the first standard but almost met the second.

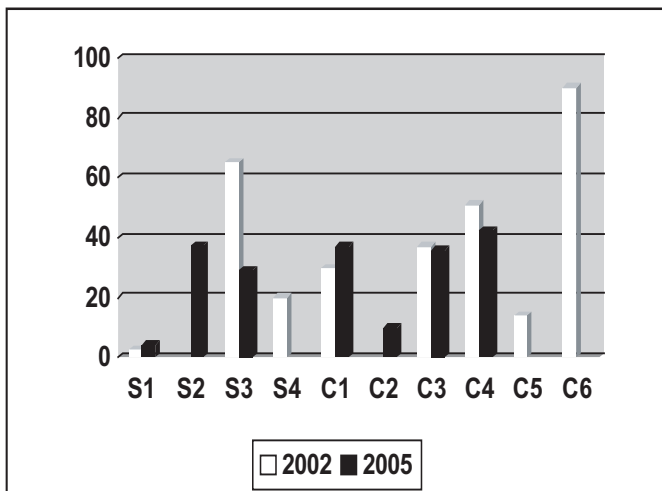


Figure 1. Overall retainer failures (%) - 2002 and 2005 (S4 C5 C6 not audited in 2005; S2 C2 not audited in 2002)

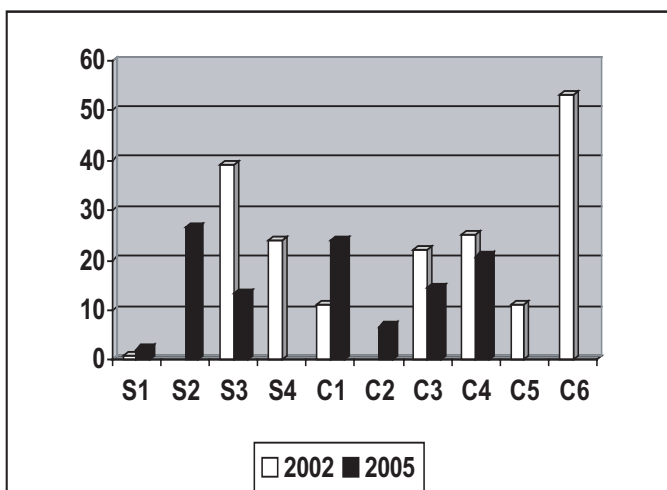


Figure 2. Retainer individual bond failure rates (%) - 2002 and 2005 (S4 C5 C6 not audited in 2005. S2 C2 not audited in 2002)

DISCUSSION

Our original audit demonstrated high retainer failure rates and marked inter-operator variability. When we discussed possible reasons for the failures the main points were: inadequate lingual enamel preparation, failure to dry enamel thoroughly before priming, difficulty in placing an unsupported wire and insufficient time allowed for the procedure to be carried out precisely. Operators were often unaware of their initial failure rates and discussing results with them was a constructive process. A majority have since improved their individual performance (3 of the 5 clinicians who were included in both audits). The improvement in outcomes is probably influenced by improved precision of technique, use of positioners and reduced use of the 3-3 design.

This audit found no difference in the failure rates for maxillary and mandibular retainers which agrees with our earlier audit¹ but disagrees with other reports^{3,5}. This probably reflects that we mainly use maxillary bonded retainers in patients with reduced or incomplete overbites where the retainers are out of occlusion. Similarly we almost exclusively use a 2-2 maxillary design as including the canines produces a higher failure rate⁶. We felt that it was important to audit the combined departmental performance. This produced some bias as operator S1 placed the majority of retainers and had the lowest failure rate which led to skewing of the results. However most parameters improved by almost 50 percent.

CONCLUSIONS

Re-training of clinicians has improved outcomes for bonded retainers. Although only two operators met the standards set, the number of repairs has reduced. In view of the variability between clinicians we recommend regular audit for all who use bonded retainers.

PLANNED IMPLEMENTATIONS

We will seek to improve performance further by continuing to guide and monitor those operators who experience the most frequent retainer breakages. The audit will be introduced on a regional basis to other regional hospital orthodontic departments.

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AN AUDIT OF CASES 'FAST-TRACKED' DIRECTLY INTO TREATMENT IN HOSPITAL AND COMMUNITY ORTHODONTIC UNITS IN NORTH-WESTERN ENGLAND

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INTRODUCTION

Waiting times for treatment can cause distress to patients, and conflict between clinicians and Trust managers. Certain conditions may also worsen or develop complications whilst awaiting treatment.

The 1991 COG Survey¹ found that strategies for Orthodontic Waiting List (OWL) management varied substantially within the Hospital Dental Service. Average waiting times for treatment were 68.7 weeks for routine, and 3.6 weeks for urgent cases. 'Urgency' and priority were often subjectively assessed.

Each patient 'fast-tracked' directly into treatment as 'urgent' impacts on the waiting time for other patients, so probity of criteria for fast-tracking is an ethical concern.

AIMS

The aims of this audit were to assess:

- The numbers of patients fast-tracked into orthodontic treatment in the salaried provider units represented by the Manchester, Lancashire and South Cumbria Audit Group
- The probity of reasons for fast-tracking
- The likely impact of fast-tracking on OWL management.

THE 'GOLD STANDARD'

There are no national standards on either validity of criteria, or acceptable numbers of patients being fast-tracked directly into treatment. After some discussion, we set the Standard shown in Table 1. The issues of fast-tracking colleagues or their children, or cases particularly useful for training purposes, were debated, but with no consensus, so they were not included as 'valid' reasons.

Table 1: The agreed 'Gold Standard' for 'Fast-tracking' into treatment

- 'Valid' reasons to fast-track patients were agreed to be:
 - Impacted, ectopic and supernumerary teeth, (risks to other teeth)
 - Joint speciality cases (lengthy assessment & treatment process)
 - Patients being teased and/or distressed because of their malocclusions
 - Large or reverse overjets in growing patients (if attempting to modify growth)
 - Transfer cases in active treatment
- At least 90% of cases 'fast-tracking' should have reasons agreed as valid – i.e. no more than 10% for 'other' reasons.

AUDIT PROCESS

1 Assess existing practice on 40 consecutively seen new cases per unit.

2 Compare findings with the 'Gold Standard' at the next audit meeting:

3 Discuss:

- Any problems encountered in complying with 'Gold Standard'.
- Probity of 'other' reasons for fast-tracking that have been recorded,
- Potential impact of fast-tracking on patients who are on the OWL
- Evaluate any changes that are desirable, and how best to apply them.

4 Assess the need to re-audit 6-12 months later.

METHODS

The lead clinician (Consultant or Senior Dental Officer) in each participating unit collected data (see Table 2) retrospectively for the last 40 new patients seen. A retrospective design was agreed upon because the setting of the gold standard would otherwise influence the outcome of future consultations.

Table 2: Information collected for each new patient

- Hospital/Community Unit, Patient number, Date seen, Sex, Age/DoB
- IOTN grades
- Outcome (e.g. On OWL, Take directly into treatment, Refer back to GDP or SGDP etc)
- If taken directly into treatment, reason why (see Figure 1 for categories)
- Background information including number of cases taken into treatment from OWL in same period.

RESULTS

11 units participated – 9 district hospitals, 1 dental hospital and 1 community unit, but several could not retrieve all the requested data. Altogether data for 438 new patients was collected: 122 male, 184 female, 132 unspecified. Their mean age was 13.7 yrs (sd 5.0, Range 5.0-49.2yrs). The mean collection period averaged 5 weeks, but varied from 3 weeks to 5 months.

LEVELS OF 'FAST-TRACKING' – AND REASONS

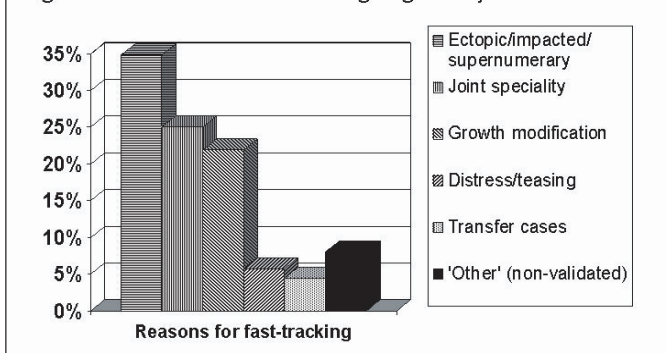
The outcomes of consultations are shown in Table 3. Over all eleven units, 112 cases (25.6%) went directly into treatment, compared to 170 (38.8%) placed on OWL's. Ectopia was the most frequent reason for fast-tracking (34.8%), then joint speciality cases (23.2%), and attempted growth modification in young patients (21.9%) - see Fig 1. Regionally, 8% of fast-tracking was for reasons agreed to be valid, but four individual units were above the 10% quota of 'Other' reasons i.e. those classified as not valid (one at 15.8%, two at 16.7% - and one at 100%, but this unit fast-tracked only one case). 'Other' reasons varied widely, but only one patient was fast-tracked purely for training purposes. Only one colleague's child was fast-tracked, but he also had a 'validated' reason.

Table 3: Outcome of new patient consultations

Information available for all units – 438 cases					
Outcome	No. cases	Percentage	Mean per unit	SD	Range
Placed on Unit's OWL	170	38.8%	15.5	7.7	4-27
Fast-tracked into treatment	112	25.6%	10.2	6.4	1-19
Other outcomes	156	35.6%	14.1	10.2	0-25

Details of 'Other Outcomes' – data available for 8 units, 102 cases (from 318 new referrals)					
Outcome	No. cases	Percentage	Mean per unit	SD	Range
Inappropriate referrals (Too soon/ unsuitable to treat)	47	14.8%	5.9	6.7	0-20
Treatment plan for referrer	52	16.4%	6.6	7.1	0-19
Patient declined treatment	3	0.9%	0.43		0-3
OWL or fast-tracked	216	67.9%			
Total	318	100%			

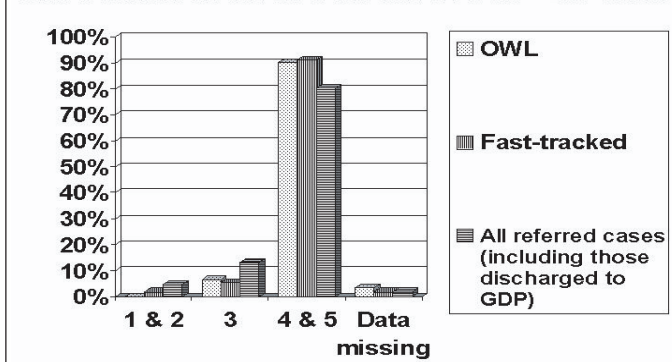
Fig 1: Reasons for fast-tracking regionally – 112 cases



Need for treatment

Seven units collected IOTN DHC grades - see Fig 2. Only 3 units collected IOTN AC grades, so these are not presented. A large majority of all patients had DHC grades of 4 or 5, but grade 3 cases were amongst both those placed on OWL's, and those 'fast-tracked'. One grade 2 case was 'fast-tracked'.

Fig 2: IOTN DHC grades of cases
Data available for seven of the eleven units – 280 cases



'Fast-tracking' and movement on and off waiting lists

See Table 4. Full data were available for eight units. There was net movement off OWL's overall, but two OWL's grew, and at 2 units at least as many cases were fast-tracked as were taken off the OWL.

Table 4: Potential for impact of 'fast-tracking' on waiting times (Full data unavailable for 3 units)

	Placed on OWL	Off OWL (same period)	Net OWL Growth	Fast-tracked
Totals	118	278	-160	96
Means	14.8	25.2	-20	12.0
SDs	7.9	34.9	42.2	6.1
Ranges	4 - 26	6 - 110	-110 - +48	3 - 19

DISCUSSION

There are no guidelines for assessing the impact of fast-tracking on waiting list management, but at several units, rates were high compared to the numbers removed from the OWL. Where cases are fast-tracked for valid reasons, this may be simply a 'workforce' issue, or reflect the types of cases being referred. In areas well supplied with specialist practitioners, hospital units may see proportionately more joint speciality cases, and so fast-track a higher percentage of cases than units in areas with few specialists. The effects of fast-tracking in terms of additional waiting times for other patients is important, but could not be meaningfully assessed because of the limited data retrospectively available from several units. There are also confounding variables, e.g. effects would tend to be cumulative at units where the OWL was growing, but of much less significance when it was short. Furthermore, some units may have different waiting times according to IOTN grade, and others not. Another factor would be the different sizes of units, reflected in the varying times to see 40 new

patients, from single operator units to large teaching units. To assess this fully would require a larger, more complex study.

Whilst it is recognised that a patient's perceived need for treatment should be considered, it may seem inappropriate if some low or borderline DHC grade cases, shown to be less likely to benefit from treatment,² are fast-tracked ahead of cases with clear need. (One 'DHC 3' fast-tracked case did, however, have a 'valid' reason for fast-tracking, and a clear AC need.) Some units did not collect IOTN data, so it would seem that 'urgency and priority' are still often subjectively assessed, as in the 1991 survey¹. Perhaps recording treatment need will become more of an issue as we move towards commissioning.

The net movement off OWL's regionally might have been due to several units building caseloads for new Specialist Registrars. Some units however, showed growth of OWL's and this should be re-assessed when new staff are not starting, or continuously over a longer period to evaluate the fluctuations associated training cycles. The data suggest that training did not cause any substantial overall increase in fast-tracking.

CONCLUSIONS

- 25.6% of new cases were fast-tracked, compared to 38.8% placed on OWL's.
- The region is within the Standard of 90% of fast-tracking being for reasons agreed as valid.
- Four individual units, however, were in excess of the 10% 'quota' of non-validated reasons.
- Full IOTN data were not available for all units, but it seems that about 7% of 'fast-tracked' cases had no clear need for treatment, which could be hard to justify to management in the future.
- Regionally, waiting lists reduced during the period of audit, but this might have been due to new staff starting at some units.
- At some units, levels of fast-tracking were high if balanced against the net flow on and off the OWL's, and this may impact on waiting times for other patients. It may however be a reflection of the kind of referrals some of these units receive, and other orthodontic services in their areas.

FUTURE PLAN

Prospective re-audit is planned to more closely assess the points raised above regarding the fast-tracking of some low need cases, the interactions of new staff, flow on and off OWL's, and fast-tracking. A prospective design would facilitate collection of all the requested data, and thus allow fuller assessment of these points. Data collection at a different time of year may reduce the effects of newly arrived clinicians, or collection over a longer period to evaluate these fluctuations. Ideally it should include some assessment of the increase in waiting times for other patients due to fast-tracking, although, as explained above, this would be a more complex.

Acknowledgements

I would like to thank the members of the Manchester, Lancashire & South Cumbria Regional Audit Group who collected data in the units: Mrs CA Asher-McDade, Mr PA Banks, Dr DR Bearn, Mrs S Caldwell, Miss Y Jones, Miss O Keith, Mr DH Lewis, Dr NA Mandall, Mr MJF Read, Mr J Smith, Dr M Trenouth and their staff.

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POST-ORTHODONTIC RETENTION METHODS: CLINICIANS' PREFERENCE

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INTRODUCTION

A number of methods of retention and design of retainers have been used to maintain orthodontic alignment¹. Each has advantages and disadvantages². However, there is no agreement in the literature of a uniform selection procedure for a particular method of retention³. Furthermore, it is not clear what are the main factors which may influence the clinicians' decision in selecting a particular method of retention. Specialist Practitioners may have the same academic background and training pathways as Hospital Orthodontists but would they choose retainers for different reasons?

AIMS

1. To identify factors which influence clinicians' decision in selecting a particular method of retention.
2. To investigate whether there is any difference in the influencing factors between two groups, Hospital Orthodontists and Specialists Practitioners.

STANDARDS

The consensus view of both groups of Hospital Orthodontists and Specialist Practitioners is similar in relation to factors influencing the choice of method of retention (South Wales area).

METHODS

This was a questionnaire-based audit that was initially piloted to identify any problems. Eleven relevant factors were chosen from two sources, the literature review and the comments of orthodontists who took part in the pilot study. The questionnaire also included treatment (pre-retention) methods, retention methods and a comment section to allow the orthodontists to put forward factors they considered as important. The audit was conducted over a period of three months. Eighteen orthodontists were randomly selected from the South Wales Orthodontic Study Group. Complete anonymity and confidentiality was preserved, as neither clinicians nor patients' names were identified.

The orthodontists (11 Hospital, 7 Specialist Practitioners) completed and returned questionnaires for completed cases 76 (51 Hospital 67%, 25 Practitioners 33%). The clinicians were given 11 relevant factors and asked to score on a scale of 1-10, 10 being the highest factor which influenced their choice of retention. A statistical package for social scientists (SPSS) was used to analyse the data.

RESULTS

The three most important factors were type of orthodontic treatment, period of retention needed and comfort. The total mean scores were 6.11, 5.48 and 4.9 respectively, whereas, patient' age, cost and patients' gender scored the lowest (Table 1).

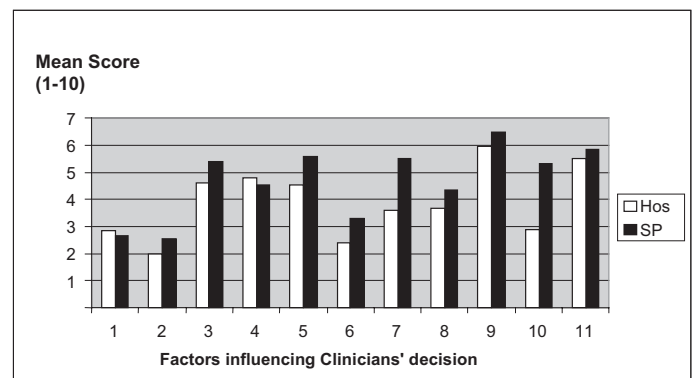
Table 1. Ranked mean scores. Reasons for choice of retainers

Type of Orthodontic Treatment	6.11	Ease of Alteration	3.90
Period of Retention	5.48	Standard of Lab Work available	3.65
Comfort	4.91	Patient's Age	2.78
Complexity of the Case	4.86	Cost	2.77
Aesthetics	4.72	Patient's Gender	2.18
Oral Hygiene Consideration	4.23		

There was no significant differences between the total mean score of both groups of orthodontists. However, analysis of the results of each factor demonstrated statistically significant differences ($p < 0.05$) in oral hygiene consideration, standard of laboratory and cost, in these instances the Specialist Practitioners scored the highest.

Comparison between the mean scores of the two groups of orthodontists is shown in figure 1. Various treatment methods used for patients by both Hospital Orthodontists and Specialist practitioners (table 2).

Figure 1. Comparison between the mean scores of the two groups of orthodontists: Hospital Orthodontists and Specialist Practitioners.



1. Patient's gender
2. Patient's age
3. Complexity of case
4. Aesthetics
5. Comfort
6. Cost
7. Oral hygiene consideration
8. Ease of alteration
9. Type of orthodontic treatment
10. Standard of laboratory work available
11. Period of retention needed.

Table 2. Treatment methodology

	Removable	Fixed	Functional	Combination	Total appliances
Hospital	2	39	1	9	51
Specialist Practitioners	2	19	1	3	25
Totals	4	58	2	12	

There was a high statistical correlation between the total mean scores of the two groups of orthodontists. Very few comments were made by the respondents, 3 Specialist Practitioners mentioned that "patient's wishes" would be an important factor.

DISCUSSION

The findings of this audit regarding most influencing factors were compatible with the suggestion of other workers⁴. It was emphasized that a prescription for retention needs to be designed for an individual patient based on the type of treatment, original features of the malocclusion and growth potential.

Since the "type of treatment" as found to be the most important factor, it is worthwhile investigating, in more detail, the original feature of malocclusion and the type of fixed treatment appliances used.

In general, there was an agreement between both groups of orthodontists in relation to factors influencing their decision-making. However, individual analysis showed that there was only a difference in three factors, namely, 'oral hygiene consideration', 'standard of laboratory work available' and 'the cost'. This may be due to the different type and period of treatment, retention methods and various techniques employed by the orthodontists in specialist practice and remuneration method. Although some factors scored higher than others, in this audit, there is a real possibility that various factors are interlinked.

For instance, the age of the patient may have a bearing on the period of retention, adult patients often require longer or permanent retention⁵.

CONCLUSION

The retention plan should be tailored to the individual patient taking into account, the type of orthodontic treatment, the period of retention needed and comfort. However, complexity of the case, aesthetics and the oral hygiene should be also considered.

There was no statistically significant difference between the two groups in relation to influencing factors for choosing retention methods. However, these results should be interpreted with caution due to relatively small sample that confined to one area of the Principality. A nationwide audit, in this respect, would be ideal.

Acknowledgements

Many thanks to Mr Peter Durning for his help during this study

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SOUTH WEST THAMES REGIONAL PILOT AUDIT ON HOSPITAL ORTHODONTIC RESTORATIVE SERVICES

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INTRODUCTION

The current literature yields little data in regards to hospital orthodontic-restorative services. A 10 year report of a dental hospital orthodontic-restorative clinic has given insight into the evolution and organization of such clinics.¹ In addition, information was given regarding the age, gender and number of patients seen per clinic, and the origin of the referral, reason for attendance and outcome of the consultation. However, these findings do not report on which restorative specialists provide treatment, referral destination of restorative treatment if it is not provided in the hospital, and joint orthodontic-restorative services carried out in district general hospitals.

AIMS

To collect data from orthodontic hospital consultants in the South West Thames region regarding:

1. Type of joint hospital orthodontic-restorative service provided
2. Who provides the joint orthodontic-restorative hospital service
3. Where are patients referred to if this joint service is not provided in the hospital setting

METHOD

A postal questionnaire was designed and sent to 12 orthodontic consultants working in 7 orthodontic departments, in the South West Thames region, as part of a pilot, between February and April 2005. Each consultant was invited to complete the questionnaire and assess it's the readability anonymously, then to return it in the stamped addressed envelope provided. The questionnaire asked for their assessments regarding joint orthodontic-restorative treatment: referral destination, reason for referral, average waiting time for joint clinic appointment, types of restorative treatment undertaken in each departments, types of restorative specialists in each department and outward referral of restorative treatment.

RESULTS

Ten out of 12 postal questionnaires were returned. Two of the 10 responders made comments with regards to the readability of the questionnaire, with a further 1 declining to participate in writing. Two questionnaires were not returned, leaving 7 completed responses.

Fifty percent of referrals to the joint orthodontic-restorative joint clinic were from GDP's. The commonest reasons for referral were hypodontia, dental trauma, spacing and crowding, as shown in Table 1.

With respect to the origin of joint orthodontic-restorative referrals to their department, all 7 responding consultants reported that GDP's are a referral source. Six of the 7 also reported they receive referrals from specialist orthodontists, oral surgeons and community dentists. Four and 3 reported referrals as well from restorative and orthodontic hospital departments respectively. Other referral origins were ENT and paediatric dentistry.

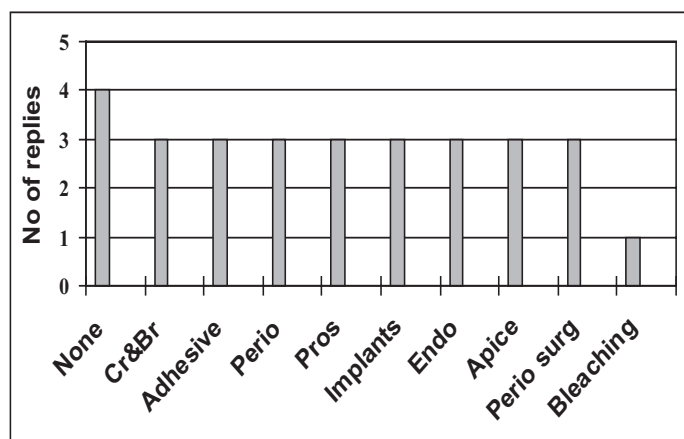
Four out of 7 orthodontic consultants reported an average waiting time for an orthodontic-restorative joint clinic of 1-3 months, whilst 3 out of 7 reported 3-6 months.

Reason for referral to joint orthodontic-restorative treatment	No of Orthodontic consultants responding (n=7)
Hypodontia	7
Dental trauma	7
Spacing	6
Crowding	6
Tooth surface loss	5
TMJ problems	5
CL&P	5
Periodontal disease	4
Enamel and dentine defects	4
Micodontia	4
Supernumerary	4

Table 1. Reasons given regarding referrals for joint orthodontic-restorative treatment

Figure 1 shows the types of restorative treatment provided in the South West Thames regional district general hospitals. Four out of 7 orthodontic consultants reported that no restorative treatment is undertaken in their departments, and 2 have no restorative specialist colleagues available.

Figure 1: Types of restorative treatment provided in the South West Thames regional hospitals (n=7)



The types of restorative specialists who are available in the hospital setting to undertake restorative dentistry is seen in Figure 2. If restorative treatment is not offered in the hospital, figure 3 reveals where it is referred to. All 7 orthodontic consultants referred to GDP's, followed by 57% referring to a teaching dental hospital.

Figure 2 Number of restorative specialists and dental hygienists in the South West Thames regional hospitals (AssSp = Associate Specialists, SG= Staff Grade, n=7)

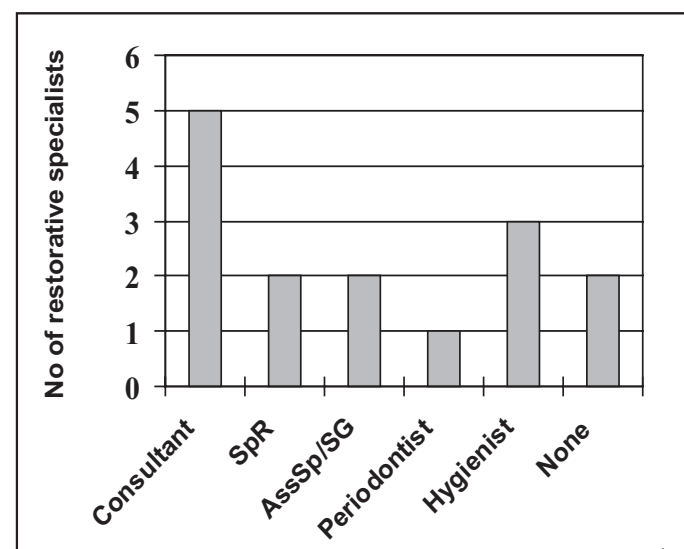
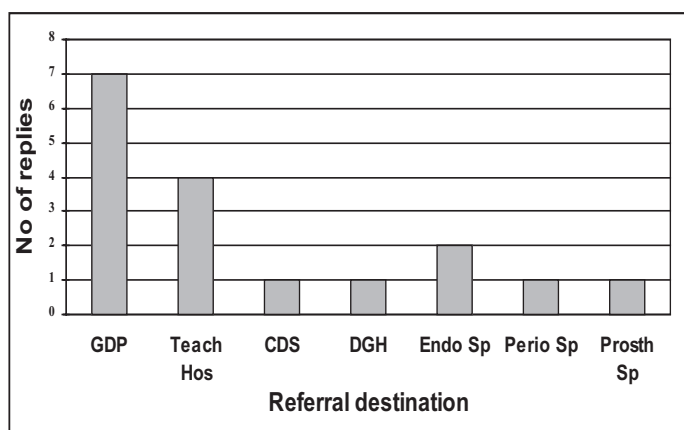


Figure 3: Referral destination of restorative treatment from hospital dentistry in the South West Thames Region (n=7)



DISCUSSION

The reasons for referral to the joint orthodontic-restorative clinic were similar to those reported by Oliver et al., (1997) where spacing associated with hypodontia was the most commonly stated. In addition, this audit revealed that referral following dental trauma to be equally as common.

Only 3 out of 7 responding consultants could offer their patients a wide range of restorative treatments within the hospital services. This may be due to limited funding of hospital restorative-orthodontic treatment and/or the unavailability of hospital restorative specialists. Some, but not all departments can provide an advisory restorative service, and restorative treatment is referred to a teaching dental hospital, another district general hospital, general dental practitioners or restorative specialists in practice. In some areas there may alternatively be access to good GDP's and restorative mono-specialists as an alternative to carry out restorative treatment, but this is not universal. This highlights the limited access to joint hospital orthodontic-restorative services, which reduces the quality of service provided and may result in patient dissatisfaction.

The results reveal that all consultants referred some restorative treatments back to the patient's GDP's. It may be that some simpler cases can be handled by GDP's, thus releasing the hospital restorative specialists to treat the more complex cases and reduce the waiting lists.

In addition, only 2 SpR's in restorative dentistry were reported to be undertaking their specialist training in this region. This reflects the smaller number of NHS restorative consultants compared with orthodontic consultants in position (Health trends, 1994).² The findings confirm the problem of limited access to specialist restorative treatment.

This pilot audit highlights the need to obtain information regarding joint orthodontic-restorative hospital services from a larger sample group. Information regarding hospital criteria for accepting patients for joint orthodontic-restorative treatment, type of treatment, who provides the treatment and referral destination if restorative treatment is not provided, should be collected.

CONCLUSION

The findings reveal that some orthodontic consultants in the South West Thames region have the facility to provide their patients with a joint orthodontic-restorative consultation. Provision of most restorative treatment may be carried in another hospital, by GDP's, or restorative specialists in practice. This reflects the regional shortage of restorative specialists in the hospital service, also highlighted by the limited access to hospital restorative services.

PLAN FOR IMPLEMENTING FINDINGS

The results of the pilot audit along with some revision of the questionnaire are to be submitted to the BOS Consultant Orthodontic Group; with a view to a possible national audit of joint orthodontic-restorative hospital services.

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AUDIT OF ORTHODONTIC EXTRACTIONS CARRIED OUT IN CDS CLINICS: SUCCESS IN USING LOCAL OR INHALATION SEDATION RATHER THAN GENERAL ANAESTHESIA

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INTRODUCTION

In 1990, the Poswillo report produced 50 recommendations aimed at decreasing the risk of death or other adverse health effects during dental treatment. The recommendations included using sedation, where possible, as an alternative to the use of general anaesthesia to manage pain and anxiety in dentistry¹. This is due to the increased mortality risk associated with general anaesthesia in comparison with using conscious sedation techniques. This recommendation has been further confirmed by guidelines from the Royal College of Anaesthetists², the Clinical Standards Advisory Group³ and the Department of Health⁴. According to national guidelines, inhalation sedation is the technique of choice as an alternative management aid in children who are unable to tolerate dental treatment under local anaesthesia alone⁵.

Many patients who are unco-operative for orthodontic extractions in general dental practice are referred to the community dental service (CDS) where inhalation sedation is widely used. This audit looked at the success rate of CDS clinics in carrying out the extractions under local (LA) or inhalation sedation (IHS) rather than general anaesthesia (GA).

AIMS

To review if the CDS clinics within the PCT were successful in achieving orthodontic extractions for most patients without the use of GA. To review the reasons why some patients did require a GA for their extractions.

STANDARDS

The standards routinely applicable within the CDS clinics are:

- (i) Routine orthodontic extractions should be carried out under LA or LA/IHS rather than GA.
- (ii) Exceptions for this standard include certain medical conditions such as severe learning disability
- (iii) All patients and their parents/ legal guardians were involved in an informed consent procedure in the decision to proceed with treatment
- (iv) All patients were deemed to have adequate understanding and willingness to undergo the procedure before active treatment was commenced (with the exception of severe learning disability)
- (v) When treatment was to be carried out under IHS, patients selected were to be of ASA class I or II and within a suitable age range (in this study all patients were aged between 8 and 15 years)
- (vi) No more than 4 dental extractions were carried out in one visit for extractions under LA or LA+IHS. The preferred pattern of treatment was extractions in a maximum of two quadrants per visit only.
- (vii) Other contraindications for IHS included: pregnancy, deafness, upper respiratory tract infection or other condition impairing nasal breathing and bleomycin chemotherapy
- (viii) For cases that did result in GA, other methods (such as LA or LA/IHS) should have been attempted first

METHOD

The study group consisted of 84 patients referred to the CDS of a single PCT for orthodontic extractions between 1.6.04 and 1.6.05. Patients were categorised according to the type of anaesthesia used to successfully complete the orthodontic extractions:

- (i) LA alone
- (ii) LA + IHS (40% nitrous oxide)
- (iii) GA

RESULTS

The average age of the group was 11.9 years. This consisted of 55% girls and 45% boys. Two patients failed to cope with extractions under LA or LA/IHS and declined the offer of GA. The orthodontic specialist was then asked to revise the treatment plan in these cases. Orthodontic extractions for 82 patients were carried out as follows:

- (i) 32 patients: LA alone,
- (ii) 34 patients: LA + IHS
- (iii) 14 patients: GA

Of the 14 patients that had extractions under GA, the following reasons were given:

- 7 cases involved carious first molars that needed extraction to prevent pain
- 4 cases had severe phobias and had refused the extractions under LA or IHS + LA
- Two patients were medically compromised. One patient was referred for surgical removal of impacted lower second molars.

DISCUSSION

The majority of orthodontic extractions were carried out without the use of general anaesthesia. All patients in the study were encouraged to attempt having extractions under LA or IHS before an offer of extractions under GA was made.

The commonest reason for extractions under GA was a severe dental phobia. Some aspects of malocclusions can adversely affect the longevity of a healthy dentition, for example a deep traumatic overbite, unprotected proclined incisors or impacted teeth and in these cases the use of GA may be justified. However, many orthodontic extractions are carried out purely to improve cosmetics: this may not be seen as a justification for the use of GA^{8,9}. In these cases, the orthodontist, patient and parent need to discuss further the risk / benefit ratio of proceeding with the extractions. This is especially true in the case of the medically compromised patient who may not be suitable for orthodontic treatment even once orthodontic extractions have been completed. When compared with treatment under GA, orthodontic extractions have also been shown to be more cost-effective for the providing PCT^{10,11} and also post-operative dental anxiety was found to be less in children treated with IHS in comparison with GA¹².

CONCLUSION

Most patients needing orthodontic extractions were able to cope without the use of GA. This is comparable with other similar studies at the University of Manchester who have also shown a high success rate (up to 97%) in the provision of orthodontic extractions without the need for GA^{13,14}. The effectiveness of IHS in providing adequate pain and anxiety control for orthodontic extractions is now widely accepted. However, studies from the North of England have shown that this technique is not widely available in general dental practices¹⁵. This emphasises the importance of implementing training in conscious sedation for both undergraduates and postgraduates. This should increase patient access to the facility and further reduce the need for general anaesthesia for orthodontic extractions in the future.

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AUDIT OF THE QUALITY OF NOTE KEEPING

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INTRODUCTION

It has become increasingly important to manage and organize case notes effectively to ensure quality care for patients. The role of note keeping in clinical practice has expanded from solely being the primary clinical document of record and used in the resolution of medico-legal issues. Case notes are reviewed for a variety of reasons, including data collection for clinical audit and in payment for activity as part of contracting. In the current climate of a patient's increased right and ease of access to their medical records, it is imperative that clinicians are committed to high standards of note keeping.

AIM

To assess departmental compliance with the minimum data set recommended for orthodontic case notes by the Development and Standards Committee of the British Orthodontic Society¹ and North Glamorgan Trust Guidelines² on note keeping.

STANDARD

The gold standard was set by the department, that there should be 100% compliance with both;

- (1) The BOS minimum data set and
- (2) The North Glamorgan Trust Guidelines on record keeping.

All orthodontic case notes must: -

- 1) Have clear identifying details. 2) Be legible and in black ink.
- 3) Be dated and filed chronologically. 4) Have the clinician's signature and printed name. 5) Have clear history, diagnosis and treatment plan. 6) Only use approved abbreviations. 7) Have cancellations and failure to attend recorded. 8) Retain the original record if any alterations are made. 9) Record the BOS minimum data set.

AUDIT PROCESS

Two clinicians reviewed 72 consecutive sets of case notes of discharged orthodontic patients to assess the quality of note keeping. The data was collected on a pro-forma under the following areas; personal details, referral details, diagnostic details, treatment plan details, investigations, correspondence and case note entries at each visit. The gold standard was 100% compliance in the recording of 55 specific data items

RESULTS

The results are a summary of the most important of the 55 separate areas that were looked at. Presentation all the results data would be too detailed and add little further value.

Data recorded	Case notes complying with gold standard
Clinical assessment	
Extra/intra-oral	93%
Upper/lower arch	93%
In occlusion	93%
Functional assessment	50%
Correspondence	
Discharge letters	100%
Post- initial consultation	97%
Treatment Plan	97%
Radiographic report	93%
Record of treatment	
Date	100%
Clinician-signed and printed	100%
Legibility	100%
Failure to attend	100%
Personal details	
Telephone number	28%
Referral source	100%
Medical & social history	100%
Presenting complaint	87.5%

Table 1. Summary of results

DISCUSSION

The results of the audit were discussed at a departmental meeting. None of the case notes examined met the gold standard set in all 55 areas. Particular areas of concern were failure to record emergency contact details in three quarters of cases and the results of the functional assessment in half of the case notes examined.

RECOMMENDATIONS

- Review preparation procedures for hospital notes to ensure that all necessary patient information is present.
- Drafting of departmental guidelines on note keeping for the information of new trainees.
- Re-audit in one year to review the quality of note keeping.

REFERENCES

- 1 *Orthodontic records: Collection and Management - Appendix 1 - minimum data set. Development and Standards Committee of the British Orthodontic Society, 1999.*
- 2 *North Glamorgan NHS Trust Standards for documentation in patients records 2000*

OUTCOME OF SURGICAL EXPOSURE OF UNERUPTED PERMANENT CANINES

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BACKGROUND

The impaction of permanent canine teeth is relatively common, affecting approximately 1.5% of the population^{1,2}. Maxillary canines are more commonly affected than mandibular, and palatal impaction of maxillary canines is more than twice as common as buccal impaction^{3,4,5}. Management often requires the collaboration of Oral and Maxillofacial surgeons and Orthodontists. Poor diagnosis and subsequent management may result in a range of problems from damaged teeth to multiple surgical interventions.

AIMS

The purpose of this audit, conducted in a district general hospital, was to investigate the success rate in early management of impacted permanent canines. We wished to investigate:

- whether a treatment plan was devised
- if this plan was followed
- the success rate of canine eruption following surgery
- the re-exposure rate

In view of the time needed to complete full orthodontic alignment following surgery, final canine position was not assessed in this audit.

STANDARDS

1. A treatment plan was devised in every case.
2. The treatment plan was followed in every case.
3. 100% of patients were reviewed following surgery.
4. 100% of exposed canines subsequently erupted and were available for orthodontic traction.
5. No canines required re-exposure.

AUDIT PROCESS

A retrospective audit was carried out on records of all patients who had undergone surgical exposure of permanent canines between January 2002 and February 2005 at Kettering General Hospital. Surgical episodes were identified from the main OMFS theatre database. 142 consecutive patients were identified. Hospital notes were sought to identify:

1. The existence of a treatment plan devised by an orthodontist.
2. The actual treatment plan followed by the surgeon.
3. Review after surgery by OMFS / Orthodontics.
4. Success or failure of canine eruption followed by exposure.
5. Evidence of need for further surgery.

In addition the following data were also noted:

1. Tooth / teeth exposed
2. Date of exposure
3. Age and gender of patient at time of exposure
4. Type of flaps employed.

RESULTS

Of the 142 patients identified hospital records could not be found for 22. It was assumed that many of these patients had been referred directly from a specialist practice. Thus the records of 120 patients were scrutinised. The sample consisted of 60% female and 40% male patients.

Classification/distribution of impacted canines in the 120 cases operated upon

- 107 (89%) maxillary
- 13 (11%) mandibular
- 5 (63%) single canine
- 41 (34%) bilateral canines
- 4 (3%) three or more exposed

Position of 120 maxillary canines exposed (107 patients)

- 83 (69%) maxillary palatal
- 37 (31%) maxillary buccal

Type of surgery for the 37 buccal maxillary canines

- 33 (28%) apical repositioned flap
- 4 (3%) buccal flap and bond gold chain

Treatment plan and post surgical review

- 100% had a treatment plan recorded in the notes provided by the orthodontist
- 83% of patients, the treatment plan was followed by the surgeon. Therefore in 17% of patients, there was a deviation from the treatment plan.
- 43% of cases were reviewed on the maxillofacial clinic following surgery.
- 100% of cases were reviewed by the orthodontic team separately.

Success of surgical exposure

- 96% of cases were successfully exposed, allowing further eruption of the tooth.
- 4% of cases were deemed unsuccessful, requiring surgical re-exposure.

Correlation between re-exposure and treatment plan

For the 17 (14%) of cases, where the treatment plan was not followed, only 4 (3%) cases required re-exposure.

DISCUSSION

In this study, a significantly higher proportion of the maxillary canines were buccally placed compared to other studies^{1,2}. This, however, is a sample of treated cases, rather than of referred cases.

Review of all cases in the Orthodontic Department with the additional review of 43% by Oral and Maxillofacial Surgery is not an efficient use of hospital resources.

In the 17% of patients, where the orthodontic treatment plan was not followed by the surgeon, there were a variety of reasons. In Kettering General Hospital, the majority of cases requiring exposure of a palatal canine are provided with a healing plate and Coe-pak. In 11 cases healing plates were not fitted. In 2 cases, the upper canines were extracted. In 2 cases the healing plates were not constructed, and in 1 case, the healing plate was found to be ill-fitting. In the remainder bonding was not carried out at the time of surgery as originally treatment planned. These were mainly cases where further eruption of the buccal canine had taken place, and an apically repositioned flap only employed.

CONCLUSIONS

1. Treatment plans were devised in 100% of cases meeting the standard set.
2. In 17% of cases, the treatment plan was not followed.
3. Four cases required surgical re-exposure. In only 2 of these the treatment plan not followed. Thus 2 cases may have benefited from strict adherence to the treatment plan.

ACTION POINTS

1. All cases requiring surgical exposure of canines to be reviewed on an orthodontic clinic only following exposure
2. Treatment plans should continue to be devised in every case by the orthodontist.
3. Good instructions to be given to all junior OMFS staff at induction on management of unerupted canines, in this unit.
4. Re-audit in 3 years time

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A REGIONAL AUDIT OF PATIENTS REFERRED WITH IMPACTED MAXILLARY CANINES

South East Regional Orthodontic Audit Group Daniel Burford*, Stephen Newell*, Dirk Bister, Alex Cash, Fran Coutts, Ian Crossman, Andrew Dibiasse, Jenny Herold, Nicola Johnson, Allan Thom, Don Vasey, David Young, Lindsay Winchester (*Audit Leads)

INTRODUCTION

Impacted canines affect approximately 2% of the population¹ and represent a significant proportion of referrals to hospital orthodontic departments. Of these, 85% are palatal and 15% buccal. There is some evidence to show that interceptive extraction of deciduous canines allows normalisation of the eruptive pathway of the impacted canines in many cases within 6 – 12 months, providing extractions are performed before 13 years of age¹. However, patient age is not the only determinant of success. Degree of crowding, canine overlap of adjacent incisors on the OPT and canine angulation are also important predictors^{1,2}. Generally uncrowded cases with canines which do not cross the root canal of the lateral incisor respond best to interceptive removal of the deciduous canine.

Late referral removes the option for interceptive action. In addition, root resorption has been detected in 12-48% of the incisors adjacent to palatally ectopic maxillary canines, depending on the method used to assess resorption^{3,4}. There is a risk of litigation if it can be shown that damage occurred due to failure to intervene at the appropriate time⁵. Ectopic canines should, therefore, be immediately referred for a specialist opinion. Treatment of impacted canines is time consuming and costly. Good clinical governance dictates that impacted maxillary canines are managed in the most effective manner by early diagnosis and referral.

AIMS

- To investigate the incidence of impacted maxillary canines in patients referred to hospital orthodontic units in the South East Region
- To give baseline data on canine impaction
- To identify late referrals (i.e. those patients presenting with impacted canines above 13.0 years of age) from both General Dental Practitioners and Specialist Practitioners and hence target future education appropriately

AUDIT DESIGN

A standardised proforma was used to collect the data. Ten hospital orthodontic departments within the South East Region participated in this prospective audit. All patients attending a new patient clinic in the three month period 1st January to 31st March 2004 were assessed according to an agreed protocol to identify patients referred with impacted maxillary canines. There was 100% participation from the units involved.

RESULTS

- Data was collected for 755 patients
- 66% of referrals were from GDPs, 31% from Specialist Practice and 3% were from the Community Dental Service
- An impacted maxillary canine was identified in a subgroup of 114 patients, representing 15% of referrals
- 73 patients (64%) with impacted canines should have been referred earlier in accordance with recommendations made in the Royal College of Surgeons Guidelines⁵.
- 64% of impactions were unilateral and 36% bilateral
- Impactions were more common in females (F:M = 61%:39%)
- 63% of canines were palatal, 29% buccal and 8% in the line of the arch

- Two lateral incisors showed root resorption affecting more than half the root length

CONCLUSIONS

1. Impacted maxillary canines form a significant number of referrals to hospital orthodontic departments.
2. 64% of patients with impacted canines were referred late, losing the opportunity for interceptive measures which have the potential to improve outcome in the majority of cases.
3. 2% of patients had severe incisor root resorption as a result of an impacted canine.

ACTION

1. Dissemination of audit results to primary care referrers to try and improve the timing of referral for patients with impacted maxillary canines.
2. The audit will be repeated in 2 years to assess progress and close the audit loop.

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THE INFLUENCE OF MUSCLE FIBRE TYPE AND MYOSIN HEAVY CHAIN ON LONG FACE SYNDROME

Bikram Thind

Introduction

The term Long Face Syndrome (LFS) was coined by Schendel et al in 1976 to describe individuals with increased vertical facial dimensions. In these individuals functional differences in craniofacial musculature have been found (Proffit et al., 1983a, Proffit and Field, 1983b). These authors found LFS subjects have two to three times less bite force when compared to subjects with normal vertical dimensions. Various treatment modalities including orthognathic surgery, distraction osteogenesis and functional appliance therapy are utilised to correct this vertical facial deformity (VFD). An important aspect of the long-term success and stability of these therapies is the adaptive response of the soft tissues, including the craniofacial musculature (De Dyne et al., 1999, Proffit et al., 2000). These responses include the regeneration of muscle tissue and the reorganisation of the contractile and connective tissue components.

Myogenesis

Muscle fibre formation, or myogenesis, involves the proliferation and migration of myoblasts. The myoblasts are of three types, embryonic, foetal and adult. Each of the cells has a distinct and active role in myogenesis during the various stages of development. The myoblasts migrate to sites of future muscle where they subsequently fuse to form multinucleated myotubes. This process is fundamentally the same during development, regeneration and adaptation. As the myotubes mature into the definitive muscle fibre, they become embedded in a protein and carbohydrate rich in extra cellular matrix.

Fibre Types

Muscle fibres are classified into type I and type II (a,b,c) based on their enzyme-histochemical reaction after preincubation at different pH. The major difference in fibre types is related to their intensity of contraction and the type of enzymatic machinery used for ATP formation. The type I fibres split ATP more slowly than type II and are slow twitch, however they possess high fatigue resistance. In humans, most skeletal muscles contain a mixture of all fibre types, the percentage of each determined by the activity for the which the muscle is specialised. The muscles of mastication of which the masseter is extensively studied, also possess a third type of fibres termed the intermediate fibres. These fibres have variable staining intensity and their exact role is not known. The exact overall fibre composition in the masseter is disputed. Ringqvist (1974) has reported type II fibres are in the majority but Sciote et al. (1994) have shown type I are the main fibres in masseter muscle. This variability may have been caused by individual facial morphology, occlusal relationship, the age and site biopsy. In LFS patients Boyd et al. (1984) and Hunt (1992) type I fibres were increased and type II fibres decreased in proportions when compared to controls. Type II fibres also had reduced cross sectional area in LFS subjects.

Myosin Heavy Chain

The contraction of muscle involves interaction of actin and myosin. Myosin consists of two heavy chains and two pairs of light chains. The Myosin Heavy Chain (MHC) is regarded to determine the force-velocity characteristics of skeletal fibres (Sciote et al. 2000), hence extensively studied. Ten MHC are

known to be expressed in mammals depending upon the stage of development and fibre type (Staron, 1997). Embryonic MHC and perinatal MHC are developmental, MHC I, MHC IIa, MHC IIb, MHC IIx found predominately in adult skeletal muscle, alpha cardiac MHC, MHC-extra ocular, MHC-intrafusal and MHC masticatory (in cat jaw closing muscle) have tissue restricted distribution. Interestingly the muscles of mastication especially the masseter muscle have been shown to express developmental MHCs (Butler-Browne et al., 1988) and alpha cardiac MHC (Bredman et al., 1991). One reason for this unusual expression may be the different embryonic origin of masticatory muscles. In LFS patients there is decreased expression of alpha cardiac and MHC IIx and increased expression of perinatal MHC (Nelson-Moon, 2001). The MHC expression in LFS corresponds well with fibre distribution in these patients. This also explains decrease in bite force in these patients due to reduced expression of fast MHC. The increased proportion of perinatal MHC has been found in muscular dystrophy patients (Webster et al., 1988) and regenerating muscle after injury (Sartore et al., 1982). This may indicate LFS patients suffer from a mild form of a degenerative muscle condition.

Adaptive potential of Muscle Fibres

The mammalian skeletal muscle fibres display a great adaptive potential. This potential results from the ability of the muscle fibres to adjust their molecular, functional and metabolic properties in response to altered mechanical loading and neuromuscular loading (Pette, 2002). This ability has been shown after various orthodontic interventions. Boyd et al., (1989) showed histochemically that after orthognathic surgery there was shift from type I fibre to type II fibre, with type I fibre decreasing by 12% and type II fibre increasing by 18%. Hunt in 1992 also showed there was increase in type II fibre after orthognathic surgery of over 10% but not a significant decrease in type I fibres. Interestingly the increase in type II was at the expense of intermediate fibres which decreased by more than half after surgery. Moreover the patients with high proportions of intermediate fibre adapt well after surgery and those with low prevalence of intermediate fibres showed greater tendency for relapse. Further evidence regarding muscle adaptation has come from MHC expression in animal studies. Sfondrini et al. (1996) have shown in rats the use of functional appliances leads to increased expression of IIx and IIa MHC. These MHC though expressed in fast muscle are more fatigue resistant than IIb. Gedrange et al. (2002) have shown in Pigs (which have similar proportion of fibre types to humans in muscles of mastication) an increase of type I fibre size and an increased proportion of MHC I and decrease in MHC II. This could explain why the use of functional appliances in LFS young patient is not successful. As Hunt (1992) and Boyd et al. (1989) have shown for correction of the malocclusion and long term stability fibre transition needs to be in the opposite direction to the one caused by functional appliances.

Summary

The cellular processes seen during skeletal muscle regeneration and adaptation recapitulate those evident during development. As this review has highlighted, changes in the contractile tissue component are common to all these events, as are the mechanisms by which they occur. Long-term stability of

procedures such as orthognathic surgery, distraction osteogenesis and functional appliance therapy rely on the ability of the masticatory musculature to adapt to a new functional length with concomitant changes in muscle structure. Changes in muscle structure do not occur without simultaneous changes in the contractile and connective tissue components.

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PAIN AND ORTHODONTICS

Angharad Brown

Pain is an unpleasant sensory and emotional experience associated with actual or potential damage or described in terms of such damage¹. Pain is always recognised and accepted as subjective and unpleasant, and is not necessarily associated with a stimulus. It can be influenced by emotional or cognitive factors and, therefore, be reported in the absence of direct tissue damage. In principle, pain serves as a 'warning signal', enabling the organism to sense impeding tissue damage and thus avoid harm².

Pain and discomfort are commonly reported during orthodontic treatment³. Most pain/discomfort is reported during the first day(s) of treatment and Patel³ reported that one in ten patients interrupted his/her therapy due to the pain experienced. Fear of pain has also been reported as a reason for patients not wishing to start treatment⁴.

Patient motivation and expectations are important filters, which act upon the perception, appraisal and experience of pain during orthodontic treatment. The ability to 'control' a situation can also reduce the experience of both stress and pain⁵. There is also a 'learning' role in pain behaviour, and cultural differences have been noted in several studies^{6,7}.

No relationship has been found between a patient's gender, social class, the dental arch being treated and the levels of discomfort reported during orthodontic treatment⁸⁻¹¹. A number of studies have suggested that girls report pain and ulceration caused by the appliances much more frequently than boys^{12,13}. However, the validity of these studies remains questionable as some of the samples used were small, and the gender difference unequal.

Younger orthodontic patients have been suggested to report more pain than those above the age of 16 years¹⁰, and adults have been suggested to report more pain than adolescents¹³⁻¹⁵. However, the legitimacy of using pain measurement scales in younger children must be questioned. Indeed, in one study⁸, the number of responses dropped in the evening because some of the younger children went to sleep.

Pain can only be assessed indirectly, and a variety of methods of measurement have been used. These include the Visual Analogue Scale^{10,16,17}, Verbal Rating Scale^{11,14}, Discomfort Index¹¹, Facial Pain Scale¹⁸, and the Colour Analogue Scale¹⁸. The interpretation and completion of questionnaires used to determine the subject's perception of pain^{10,13} is often demanding. One study reviewed, required the completion of eight questionnaires at different intervals¹³.

Pain associated with orthodontic treatment usually begins approximately 2 hours after the insertion or activation of an appliance and lasts for approximately 5 days. However, there is significant variation in these parameters due to differences in study design^{9-11,14,19}. Scheurer et al.¹³ found that 25% of patients still had pain 7 days after appliance activation, and, in a few, the pain lasted more than four weeks. The age range in this study (8-53 years), and again the unequal spread of ages, questions its validity.

Burstone²⁰, found that there was an initial type of pain experienced, followed by a delayed pain response. He suggested it might be due to initial compression of the periodontal ligament, after appliance activation, followed by a hyperalgesic response due to the release of prostaglandins,

histamine and substance P. This has generally remained unchallenged, but more detail with regards to the mediators involved is now available²¹⁻²⁷.

The creation of periodontal ligament stresses, through the application of orthodontic forces, results in an acute inflammatory response within the periodontal tissues²¹. Prostaglandins (PG) released as part of the inflammatory process influence orthodontic tooth movement and bone resorption^{22,23}, but are also pain mediators. PG inhibitors such as Non Steroidal Anti-inflammatory Drugs (NSAIDs) have been shown to reduce pain but also impair tooth movement²⁴⁻²⁷. However, PG's are not the only mediators involved in tooth movement and, therefore, the use of NSAIDs in patients undergoing orthodontic treatment cannot be totally dismissed¹⁷. Also, most of the information about the involvement and the influence of chemical mediators is based on animal studies^{22,23}.

Studies comparing the use of different methods of alleviating pain during orthodontic treatment recommend Ibuprofen²⁶, acetaminophen²⁷, and wax containing benzocaine¹⁶. Patients who do not respond or elect to use pharmacological therapy have had few practical alternatives. Some authors have suggested that a reduction in the magnitude of applied force reduces the pain experienced²⁸. However, the relationship between the force applied and the resultant discomfort has been difficult to establish^{8,9,14,29}.

Some discomfort/pain may be experienced when debonding appliances. It appears that the discomfort threshold is influenced by the mobility of the tooth and the direction of force application. Patients withstand intrusive forces significantly better than forces applied to the mesial, distal, facial, lingual or an extrusive direction³⁰. However, this information must be interpreted with caution, as the results are based on a sample of only fifteen patients (with an unequal gender spread).

In summary, pain is common during orthodontic therapy^{9-11,13,14,19}, and is, largely, unavoidable due to the nature of the tissues reaction to the physiology of tooth movement and the soft tissue insult resulting from contemporary appliances^{20,22,23}. The pain reported will be subjective and influenced by personal previous pain experiences and motivational attitude. Analgesics that are commonly recommended have been shown to affect tooth movement to a degree²⁴⁻²⁷. Improved clinical technique, limiting the forces used, and careful adjustments all contribute to reducing the pain experience, as well as providing information about the anticipated or ongoing treatment, which can give a sense of 'control' (reducing both stress and pain)⁵.

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RESORBABLE FIXATION – A REVIEW OF THE LITERATURE

Trevor Hodge

Introduction

Traditionally, rigid internal fixation after orthognathic surgery has involved placing titanium plates and/or screws across the bony fragments to provide a secure union so undisturbed fracture healing can occur. Compared with inter-maxillary fixation, rigid internal fixation has advantages for patients as it is safer and allows them to resume normal function much more quickly after surgery. However patients can be concerned about the metal that remains after the bones have healed which only needs to be transient as their purpose in fixation is only temporary. In addition there can be problems with palpable plates, intra-oral exposure, disturbance in normal growth pattern in children¹, passive migration, and distortion of magnetic resonance images (MRI) and computed tomograms (CT) if these are required in future. In recent years surgeons have been placing bioresorbable plates and screws made out of poly-L-lactide and polyglycide. The suitability of resorbable fixation raises three questions.

Is resorbable fixation sufficiently strong at insertion?

Araujo et al² attempted to answer this question by comparing the biomechanical characteristics of metallic and polymeric fixation systems using a 3-dimensional skull model and simulating clinical conditions of maxillary advancement and functional loading (relapse and biting forces). Both plating systems were found to be able to withstand at least 64 lbs of force and that overall resorbable fixation was of adequate strength and stiffness. Unfortunately the results only show that the initial strength of the resorbable material is greater than known physiological loading levels. What this model does not tell us is the degradation of the mechanical properties of the resorbable material with time after implantation which is significant post-operatively when the structural integrity of the jaws is lost and the functional loads are borne entirely by the fixation devices. For example, the adaptation of resorbable plates to non-linear bone surfaces, usually in the maxilla, requires that they be heated above the glass transition of its constituent polymers. Frequently the application of hot water to polymers initiates early hydrolysis and breakdown, which in turn may adversely affect plate strength postoperatively. As yet no studies have addressed this question. This may be due to lack of a suitable model to test the hypothesis or because clinical results assume sufficient strength from these heat-adapted plates as they appear to provide adequate stability in fixation^{3,4,5,6,7}.

Does resorbable fixation provide as good stability as metal fixation?

Early research showed that these plates could hold the bones together adequately. Edwards et al³ used a sample of 12 subjects who had had maxillary or mandibular surgery and who had received resorbable miniplates and screws. The patients were then recalled over a 2 year period after surgery and follow-up radiographs showed that these materials held the segments together extremely well during initial healing. Following on from this work Turvey et al⁴ found, from their experience of 70 patients, the use of self-reinforced polylactide bone plates and screws to stabilize was also favourable. After accounting for 3 patients who had immediate postoperative loosening of maxillary plates they found no cases of instability or non-healing. However more convincing was the work of Ferretti and Reyneke⁵ who conducted a prospective,

comparative study of postoperative stability. They allocated 20 consecutive bilateral sagittal split patients to titanium and 20 consecutive patients to resorbable screw fixation (82% poly-L-lactic acid and 18% polyglycolic acid). Cephalometric follow-up at 1 week and after a minimum of 6 months postoperatively revealed no statistical difference in long-term stability between the two groups and the authors concluded that the resorbable fixation used was a viable alternative in advancement bilateral sagittal split osteotomies. Similarly Matthews et al⁶, in a prospective trial comparing 11 patients in whom self-reinforced poly-L-lactide (SR-PLLA) screws were placed with 11 patients using titanium screws, found no difference between the groups 1 year after operation looking at skeletal relapse radiographically. More recently Norholt et al⁷ have taken this work further with a randomized, prospective study comparing LactoSorb™ plates with titanium osteosynthesis for the fixation of Le Fort I osteotomies. This study had an inclusion criterion of patients needing maxillary advancement and/or impaction assessed with respect to Proffit's Hierarchy of Stability⁸. They concluded that changes in maxillary position were not clinically noticeable in either of the treatment groups at 12 months.

Does resorbable fixation biodegrade and leave good bone quality?

Degradation of resorbable fixation occurs primarily by hydrolytic activity and also through non-specific enzymatic phagocytosis, the rate depending on molecular weight, crystallinity, thermal history, and implant geometry of the fixation. Waste products are mostly exhaled during respiration although some are excreted in urine. The estimated length of biodegradation is 2-3 years. But what is the histologic or clinical evidence that the devices completely resorb by a physiological process that does not induce inflammatory tissue reactions and be replaced by bone?

This question was in part answered by Edwards et al³ who found that by 18 months post-operatively that radiographically the screw sites had a good infill of trabecular bone with resorption and no osteolysis. More importantly, beyond a radiographic examination or clinical palpation, one patient consented to biopsy at 2 years. In this case there was complete healing with normal bone with no microscopic traces of the resorbable screws and plates. In contrast Landes and Kriener⁹ took 10 mandibular plate, screw, hard-tissue, and soft-tissue specimens at 3,6,9 or 12 months postoperatively in patients who were having secondary operations e.g. dental implant placement and who had previously had mandibular resorbable fixation placed. They found frequent screw remnants and multiple degraded particles of plate however none of these patients were followed up for as long as the case Edwards et al³ reported.

CONCLUSION

From the literature it appears that bioresorbable fixation is a safe and satisfactory means of securing bony fragments post orthognathic surgery. However in spite of the perceived advantages of this material it should not be forgotten that there is a learning curve in the use of these materials, e.g. the need to acquire the fine tactile sense in the tapping of holes for resorbable screws in all thicknesses and types of craniofacial bone, and there may be associated morbidity before consistent successful, clinical results are obtained. In addition the cost of these materials is greater than with titanium osteosynthesis.

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EDITOR'S CUT

Well this is indeed a bumper edition! You, the readership, are rising increasingly to the challenge of publishing your audit projects. This is to the benefit of fellow BOS members (and other invited readers) and certainly benefits our patients. The more we can print, the more we will learn.

Audit isn't research, but the rigour of research methodology is being utilised increasingly in the production of the articles you read in these pages. This is very beneficial to their quality and is a reflection on the high standard of training in British Orthodontics. The referees, who are FTTA's highly conversant in this discipline, continue to have a major impact. Our thanks go to them again for their contribution,

which has become integral to the publication of this Bulletin.

Next year, with the help of Jeremy Knox (Assistant Editor), we are thinking of expanding editorial team and devolving some of the roles. This is in response to the number and quality of submissions, and is a part of the evolution of the Bulletin. If there are enough articles sent in during the early part of the year, or submissions continue to increase, the CEC are considering more than one edition a year.

The deadline for submissions for next year's edition is 1st June 2006.

The address for submissions remains gavin.barry@whnt.nhs.uk



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