IN BRIEF

- Unilateral cleft lip and palate (UCLP) patients who had undergone orthodontic treatment in the NHS consultant-led service had a good standard of orthodontic care.
- This means PAR reduction could be used as a benchmark for future audit projects and the annual NHS consultant appraisal process.
- Specific issues such as buccal segment relationships on the cleft side create difficulties for orthodontists during treatment for UCLP patients.
- Some cases (7.5%) which did not improve suggest that a proportion of UCLP patients are difficult to treat. This may be due to factors such as poor compliance or poor growth during orthodontic treatment.

What are the occlusal outcomes for unilateral cleft lip and palate patients? A national project in the UK

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Aim This national project assessed the orthodontic outcome for unilateral cleft lip and palate (UCLP) patients in the UK.

Method Six consecutively treated fixed appliance cases where orthognathic surgery was not undertaken were assessed using the peer assessment rating (PAR) index on orthodontic study models. These cases were submitted by NHS consultant orthodontists undertaking treatment on patients with cleft lip and/or palate.

Setting UK NHS consultant-led hospital service.

Results The mean reduction in PAR score was 69% $\pm$ 22. The mean start PAR score was 41 $\pm$ 11. The mean end of treatment PAR was 12 $\pm$ 9. The proportion of cases where the score was worse or no different was 7.5%.

Conclusion The mean percentage PAR reduction compares well with other national projects looking at outcome from patients treated in the hospital service. The mean PAR reduction could be used as a benchmark for outcome in UCLP orthodontic treatments in future audit projects and the annual consultant appraisal process.

INTRODUCTION

Orthodontists have been involved in assessment of surgical outcome for unilateral cleft lip and palate (UCLP) using the GOSLON index¹ and/or five year index.² These two methods assess early anterior-posterior growth of the jaws of UCLP patients using orthodontic study models. This gives an

indication of the effect of the primary surgery required to repair the cleft, on growth of these structures. Despite the enthusiasm to assess these outcomes,³⁻⁹ little has been published on the occlusal outcomes of orthodontic treatment within this group of cleft lip and palate patients.¹⁰

A previous national project established a benchmark for assessing occlusal outcome in non-cleft patients.¹¹ This included contacting all 204 consultant orthodontists at the time and inviting them to submit six consecutively treated cases debonded after 1 August 1999. A total of 823 cases were assessed using the PAR index. The mean percentage reduction of PAR in this group was 78%. From this study, the authors recommended a standard for PAR score reduction for cases treated by orthodontic consultants. This standard was that 75% of cases should exhibit a reduction in PAR score greater than 70%, with fewer than 3% of cases having a reduction of lower than 30%. It was thought appropriate to use this same model to assess the occlusal outcome for patients with a complete UCLP that did not require surgical correction of the skeletal bases, in the UK.

It was intended that consultant orthodontists involved in the treatment of patients with cleft lip and palate would thus establish a national standard of outcome. It was anticipated that this might be particularly useful for lead clinicians in cleft centres treating large numbers of cleft lip and palate cases. It would allow them to monitor their own outcomes and assess the spoke orthodontist treating small numbers of cases within their departments. Such a standard could also be utilised in the annual consultant appraisal process and would allow for sensible and fair assessment of a consultant's treatment outcome, set against a national standard.

The aim of this project was therefore to assess the standard of orthodontic treatment provided nationally for patients with UCLP. This will set a level of outcome for future audit and consultant appraisal in the orthodontic care of UCLP cases.

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METHOD

Sample

All consultants in the UK involved in the provision of orthodontic treatment for cleft lip and palate cases were contacted and asked to provide pre- and post-treatment study models with the following criteria:

1. Six consecutively treated UCLP cases treated with fixed appliances
2. Appliances had been debonded prior to the submission date and cases were not excluded if the treatment had been stopped early due to poor compliance
3. Patients with UCLP who had undergone orthognathic treatment to correct any skeletal discrepancy were excluded
4. The study models were to be duplicated and anonymised prior to delivery to the scoring centre.

Additional clinical features were recorded from information supplied on a pro-forma sheet by the treating clinician and examination of the study models, by one examiner (SD). This included the following details:

- Confirm diagnosis
- Treatment length
- Number of appointments
- Cleft site
- Record congenital absence of teeth
- Record extraction patterns in each quadrant
- Evidence of space opening or closure in treatment in the incisor region
- Dental centreline position
- Incisor relationship at the end of treatment
- Overjet at the end of treatment
- Molar relationships at the end of treatment.

Assessment

A calibrated PAR scorer (PB) assessed the models and applied the standard UK weightings to the scores. These were entered onto a Microsoft Excel™ spreadsheet for analysis. The additional features were entered (SD) into a Microsoft Access™ database and manipulated in Microsoft Excel™ to generate the graphical output.

RESULTS

Nineteen units and one region submitted study models. The total number of cases assessed was 128. Figure 1 shows the number of cases provided by each of the cleft centres in each of the regions.

The overall national mean PAR reduction was $69\% \pm 22$. Dividing the data by regional cleft centre demonstrates that all regions that supplied a sample were within one standard deviation of this mean value (Table 1). The mean start PAR score was 41 ± 11 . The mean end of treatment PAR was 12 ± 9 . The proportion of cases where the score was worse or no different was 7.5%

Table 2 shows the mean treatment times and number of patient visits with the effect of extraction *versus* non extraction treatment and space opening or space closing mechanics where there is a missing upper lateral incisor in the cleft site. Sixty-five percent of the sample had a centreline discrepancy at the end of treatment. The extent of the centreline

Fig. 1 Number of cases provided by each region

Table 1 The mean PAR reduction in each of the 11 cleft centre regions

Region	Average PAR reduction	Range of PAR reduction
1	60	0-90
2	71	20-94
3	76	54-96
4	70	3-92
5	69	35-86
6	58	11-85
7	78	55-95
8	70	29-95
9	N/A	N/A
10	56	22-85
11	N/A	N/A

Table 2 Treatment length and the effect of extraction treatment and mechanics for absent lateral incisor

	Treatment length	Number of visits
Overall	27	18
Extraction treatment	26	18
Non-extraction treatment	28	17
Space opening for upper lateral	25	17

discrepancy when measured on the study models is shown in Figure 2. Missing teeth in the cleft site is common in this cohort of patients and the predominant method for dealing with this orthodontically is space closure, rather than

opening the space for a prosthetic replacement (Figs 3 and 4). The difficulty in attaining Class I molar relationships at the end of treatment on the cleft side compared to the non-cleft side is shown in Figures 5 and 6.

DISCUSSION

PAR scores

The mean pre-treatment PAR score of 41 suggests that on average, the cases were very severe malocclusions.¹¹ This figure is higher than the non-cleft cohort treated by consultants in the UK,¹¹ where the mean pre-treatment PAR was 33, and another non-cleft sample from the USA.¹² The end of treatment PAR of 12 was a figure higher than the non-cleft cohort, with a post-treatment mean PAR score of 7. The recommendation from the authors of the non-cleft cohort is that 3% or fewer cases should have PAR reductions in the worse or no different category. The cleft lip and palate cohort had twice the proportion of cases in this category. This suggests that UCLP cases deviate initially by a larger amount from the ideal and therefore may be more difficult to treat to an ideal result.

Treatment length

Treatment length is variable depending on the orthodontist and the complexity of the case. In this cohort, extraction *versus* non-extraction and space opening or closing mechanics for missing lateral incisors had little effect on the duration of treatment. The treatment length compares well with other published data on treatment length in non-cleft cohorts. There is, however, great variability in the published data, with treatment times varying from 18–30 months.^{12–15}

Centreline

Centreline correction is an important factor in the successful outcome of treated orthodontic cases. The UK weightings assign a multiplication factor of 4 to centreline discrepancies greater than $\frac{1}{4}$ of lower incisor width.¹⁶ Sixty-five percent of patients in the cleft lip and palate sample had a centreline discrepancy at the end of treatment. Due to the higher incidence of missing lateral incisors in the cleft site, it may be assumed that the discrepancy would be towards the cleft side. This was not demonstrated: 62% of cases had a centreline discrepancy with the direction of displacement to the non-cleft side. In terms of mechanics used, space closure might be expected to increase the risk of a centreline discrepancy. This is not reflected in the figures with space closure: 43% (22) of the cohort with a missing tooth on one side of the arch had no centreline discrepancy. In the space opening cohort with a missing tooth, only 26% (10) had no centreline discrepancy. These are relatively small numbers, but do suggest that space closure does not increase the risk of centreline discrepancy at the end of treatment.

Figure 2 shows that the majority of the centreline discrepancies were less than or equal to 2 mm when present. These discrepancies would not score on the PAR index and therefore centreline seems not to have contributed greatly to the final PAR score in the majority of cases.

Molar Relationship

This can be difficult to correct in UCLP cases due to the transverse and anterior-posterior relationships being affected by

Fig. 2 The size of centreline discrepancy if present

Fig. 3 Proportion of cases with missing upper lateral incisors

Fig. 4 Proportion of cases with missing lateral incisor with space closing versus opening mechanics

Fig. 5 Molar relationship on the cleft side

Fig. 6 Molar relationship on the non-cleft side

other factors, such as surgical repair of the cleft and subsequent adverse growth.^{17,18} Figures 5 and 6 suggest that it is more difficult to achieve a Class I molar relationship on the cleft side *versus* the non-cleft side. This difficulty leads to partial correction of the molar relationship in an anterior-posterior dimension, which contributes substantially to the final PAR score.

Overall PAR reduction

Overall these are encouraging results, demonstrating the high quality of outcome for patients with UCLP. This is despite other factors which would normally prevent non-cleft patients from being offered active orthodontics. These factors are poor oral hygiene and increased failure to attend. These issues, which

not uncommonly affect cleft lip and palate treatments, can affect compliance and in turn outcome.

Weightings

We applied the UK weightings as developed by Richmond.¹⁶ This allowed for comparison with a previous project that assessed occlusal outcome in the consultant-based workload in a non-cleft population.¹¹ This does have some drawbacks, as an MSc thesis suggests that subjective opinion regarding outcome for UCLP cases is different from that seen in the original PAR weightings study.¹⁹ Other weightings have been suggested but have not been validated to be used at present. The use of the UK weightings may allow for more direct comparison with outcome in other cohorts. This review of treated cases can be extremely helpful for the consultant appraisal process, which should include some documentation of outcome of orthodontic care related to available national figures.

CONCLUSION

An overall PAR reduction of $69 \pm 22\%$ is suggested as a benchmark for the occlusal outcome for fixed appliance therapy in unilateral cleft lip and palate patients.

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