

AN ASSESSMENT OF ORTHODONTIC NEED AND TREATMENT STANDARDS USING OCCLUSAL INDICES

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INTRODUCTION

Orthodontic activity has generally been assessed by parameters defining quantity rather than quality of treatment. In particular, performance indicators have been introduced into the hospital service. The number of patients, however, is not the only consideration. Quality of treatment is of paramount importance if it is to have a beneficial effect on the patient. Recently orthodontic indices have been developed to measure treatment need⁽¹⁾ and treatment outcome⁽²⁾. These indices have enabled the complex three-dimensional structure of the dental occlusion to be expressed as a mathematical value. Although this process produces anomalies it is sufficiently accurate and valid to produce a useful picture of what is happening in any clinical practice. For this reason, together with the fact that the use of occlusal indices is becoming more widespread, they have been applied to patients attending for orthodontic treatment at the Royal Preston Hospital.

METHOD

Seventy consecutively finished cases were analysed using study models taken before and after treatment. The Index of Orthodontic Treatment Need (IOTN) was applied to the initial set of models and the Peer Assessment Rating (PAR) index was applied to both pre- and post-treatment models. The details of the IOTN and PAR are given in An Introduction to Occlusal Indices⁽³⁾. The results were presented graphically (Figs 1-7) and summarised in Tables 1 and 2.

The author had attended a training course in the use of occlusal indices followed by a further course for examiner calibration.

RESULTS

1 IOTN GRADE

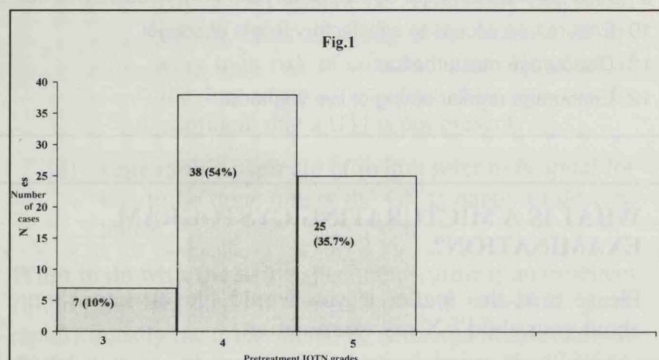
The distribution of the pretreatment IOTN grades is shown in Fig 1.

The grades used were as follows:

- Grade 1 no need for treatment
- Grade 2 little need
- Grade 3 borderline
- Grade 4 great need
- Grade 5 very great need

As the figure shows, 90% of patients were in grades 4 and 5 (54.3% in grade 4, 35.7% in grade 5), and 10% were grade 3. No patients were in grades 1 or 2.

The distribution of IOTN grades in this study is compared with those reported in previously published studies in Table 1.



SURVEY				IOTN GRADES		
Author	Date	Population	Number	1 and 2	3	4 and 5
Brooke and Shaw	1989	School unselected	333	35.1	32.1	32.7
Holmes	1992	School unselected	955	34.8	33.2	32.0
O'Brien <i>et al</i>	1993	Hospital Service	1630	1.8	10.7	87.5
Richmond <i>et al</i>	1993	GDS Non prior approval	1210	2.0	17.0	81.0
		GDS prior approval		2.5	19.5	78.0
Present Study	1993	Preston Hospital	70	0.0	10.0	90.0

Table 1

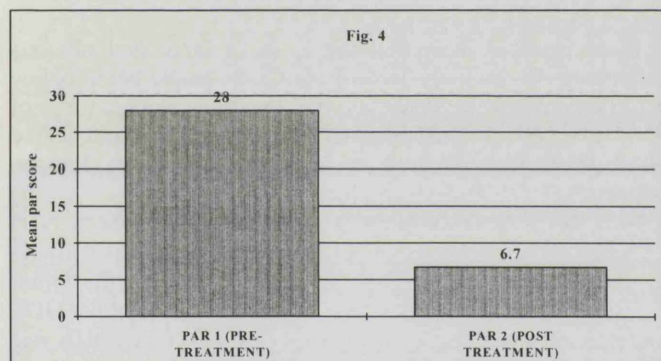
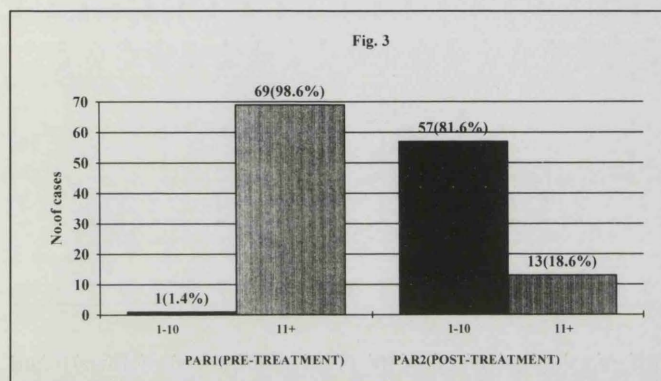
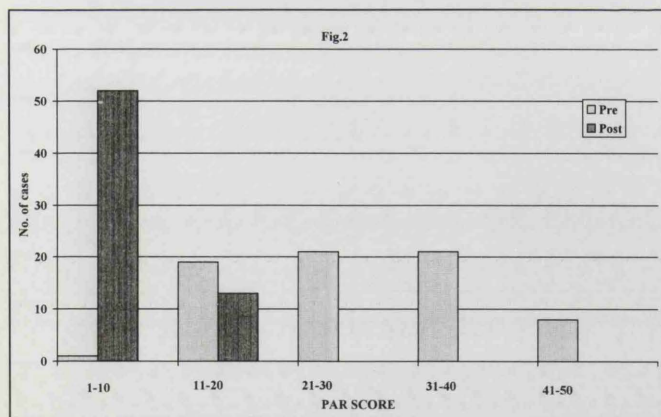
2 PAR SCORE CATEGORIES (Figs 2 and 3)

The number of cases for each range of 10 PAR units was plotted in the form of a histogram (Fig 2). There was a clear improvement in PAR score when the results before and after treatment were compared. Before treatment there was only one case (1.45%) with a PAR score below 10. After treatment 57 cases (81.6%) had a PAR score below 10 and no case had a score above 20.

The results were clarified (Fig 3) by plotting the number of cases with PAR scores above or below 10, pre- and post-treatment. Sixty-nine cases (98.65%) had a PAR score greater than 11 before treatment; this was reduced to 13 cases (18.6%) after treatment.

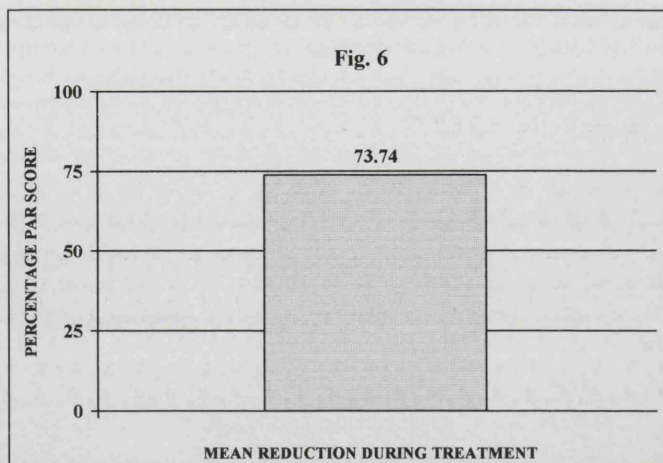
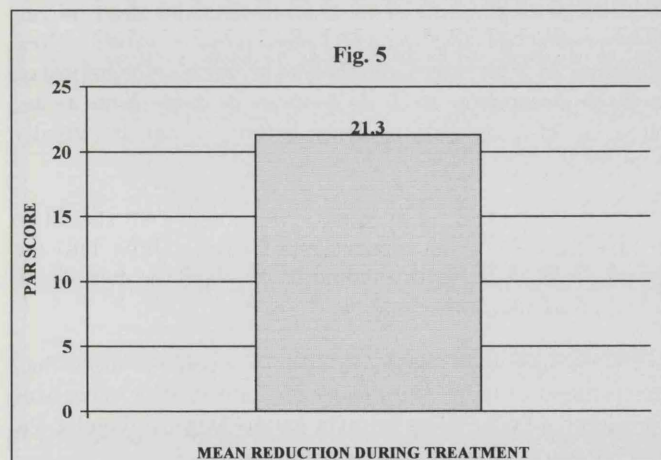
3 MEAN PAR SCORE (Fig 4)

The average PAR score was 28 before treatment and 6.7 after, thus showing a considerable reduction.



4 CHANGE IN PAR SCORE DURING TREATMENT (Fig 5)

The mean reduction in PAR score was 21.3. This is a measure of the absolute improvement in the occlusion. A greater reduction in PAR score is likelier where there is a high pretreatment score.

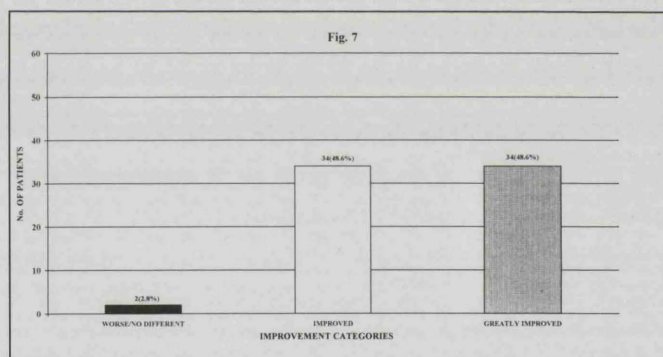


5 PERCENTAGE REDUCTION IN PAR SCORE (Fig 6)

The mean percentage reduction in PAR was 73.74%. The percentage reduction in PAR reflects the change relative to the pretreatment score. This is a measure of the relative improvement in the occlusion.

6 IMPROVEMENT CATEGORIES (Fig 7)

The majority of patients (97.2%) were in the improved categories. 2.8% were rated as worse or not different. Anomalies in the scoring system may account for a low improvement score which does not accurately reflect the clinical improvement. The discriminant analysis classified equal numbers of patients (48.6%) into the improved and greatly improved categories.



DISCUSSION

It is reassuring that according to the index (Fig 1) the vast majority of patients (90%) were in great or very great need of treatment, only 10% being borderline and none falling into the little or no need grades. It would seem that none of the patients was treated unnecessarily. It is only to be expected that some of the Grade 3 patients would quite reasonably justify treatment. Also anomalies in the index will occasionally misclassify patients who need treatment into the borderline grade.

Only two published studies are available with which to compare the results of the audit of the Preston patients (Table 1). O'Brien *et al*⁽⁴⁾ analysed 1630 records from 17 hospital orthodontic departments, and Richmond *et al*⁽⁵⁾ studied 1210 orthodontic patients treated within the General Dental Services (GDS) in England and Wales.

The Preston figures compare favourably with those of other hospital departments. O'Brien *et al* found considerable variation in the numbers of patients in the different

categories, between 70 and 98 in definite need, and between 1 and 26.5% in the borderline need grade. The Preston figures compared well largely because all the patients who fell into grades 1 and 2 were successfully eliminated from treatment.

The numbers in grade 3 were about average although it is conceivable that some of these could possibly be eliminated. When compared to the GDS figures reported by Richmond *et al* there were far more patients in the lower grades in the GDS than either of the hospital surveys, indicating poorer patient selection and weaker diagnosis in the GDS.

The referred samples differ considerably from unselected samples of school children^(1,6) where approximately one third of children fall into each of the three grades little or no need, borderline need, and great or very great need (Table 1).

TREATMENT OUTCOME - PAR

Comparison with the hospital service

O'Brien *et al*⁽⁴⁾ found similar results to this study in their survey of the hospital service. The mean pretreatment PAR score was 28.8, very close to that in the present study which was 28. Post-treatment PAR was 8.27, compared with 6.7 in the present study, indicating less residual malocclusion in the Preston patients at the end of treatment than the average in the hospital service although they were just as severe before treatment.

The mean percentage reduction in PAR found by O'Brien *et al* (Table 2) was 67.6% compared with 73.7% in the Preston patients, indicating a greater than average improvement in their occlusions during treatment.

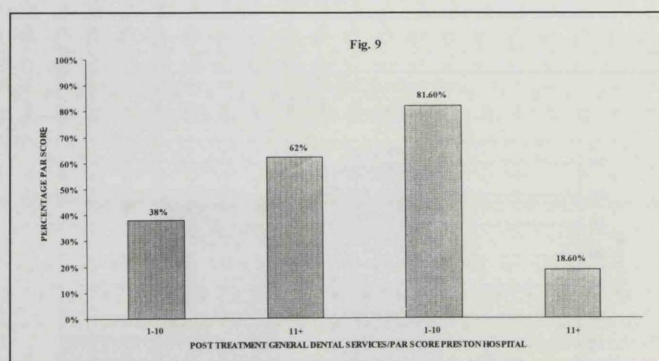
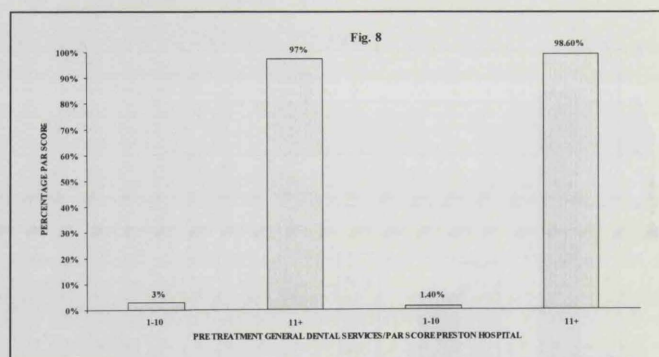
TREATMENT OUTCOME MEASURED BY PAR SCORE								
SURVEY				OUTCOME				
Author	Date	Population	Number	Worse/No different	Improved	Greatly Improved	GI/I Total	% reduction in PAR
O'Brien <i>et al</i>	1993	Hospital	1630	8.0	48.6	43.4	92	68
Richmond <i>et al</i>	1990	GDS	1010	20.7	56.9	22.4	79.3	55
Richmond <i>et al</i>	1990	Norway	220	4.0	61.0	35.0	96.0	78
Richmond	1993	Personal	51	8.0	39.0	53.0	92.0	74
Fox	1993	Personal	100	11.0	43.0	38.0	81.0	66
Present Study	1993	Preston	70	2.8	48.6	48.6	97.2	74

Table 2

For the categorical outcome (Table 3) O'Brien *et al* found 43.4% were greatly improved, 48.6% improved and 8% worse or no different. In the present study slightly more were greatly improved (48.6%), the same number was improved (48.6%) and fewer were worse or no different (2.8%).

Comparison with the General Dental Service (GDS)

Richmond *et al*⁽⁵⁾ analysed a sample of 1210 orthodontic patients treated in the GDS in England and Wales. In terms of pretreatment PAR score there was not a great deal of



difference (Fig 8). 3% of the GDS sample were below 10 and 97% were 11 and above; this compares with 1.4% and 98.6% respectively for the Preston hospital patients.

Post-treatment, however, there was a large and obvious difference (Fig 9), only 38% of the GDS sample being below 10 compared with 81.6% of the Preston sample. 62% of the GDS patients still had a PAR score of 11 and above after treatment compared to only 18.6% for the Preston patients.

A much higher degree of residual malocclusion was found in the GDS patients. This was confirmed by the other measures of PAR score outcome (Table 2). 20.7% of the GDS patients were categorised as worse or no different which was dramatically greater than any of the hospital surveys, only 2.8% of the Preston sample being in this category. Correspondingly fewer GDS patients were in the improved or greatly improved categories (79.3%) and there was a lower reduction in PAR during treatment (55%) than found in the other surveys (Table 2).

Defined treatment standards

Richmond *et al*⁽⁷⁾ compared objective measurements using the PAR index against subjective opinions of 74 orthodontic practitioners. Patients could be categorised using discriminant function analysis. In order to be considered improved a 30% reduction in PAR was required and to be greatly improved required a reduction of 22 PAR points or more. Thus a case must be of a certain severity before it can be greatly improved.

It was concluded that the mean reduction in PAR should be greater than 70%, the percentage of cases falling into the greatly improved category should be 40% and the numbers in worse or no different should be negligible.

The present study shows that Preston patients more than satisfy these criteria. The mean reduction in PAR score was 74%, with 48.6% falling into the greatly improved and 2.8% into the worse or no different categories.

The Preston figures also compare well with the personal audit reported by Richmond⁽⁸⁾ and also Fox⁽⁹⁾. In Table 2 Richmond had a mean reduction in PAR score of 74%. A higher number (53%) was greatly improved but there were more patients (8%) in the worse or no different category. Richmond recommends that the percentage of patients falling into the worse or no different category should be less than 5%. A strength of the present study was that very few patients (2.8%) were worse or no different, resulting in the highest number in the combined improved and greatly improved categories of all the studies reported. The Norwegian patients, however, had a greater reduction in PAR score (78%) indicating high standards of treatment in Norway.

CONCLUSIONS

1 No patients were being treated unnecessarily on the basis of IOTN grade. The Preston results appeared better than the other hospital and GDS surveys. The number of borderline cases, however, was on the mean. It may be possible to reduce this.

2 The outcome of treatment measured by the PAR index compared very favourably with the survey of the hospital service.

3 The outcome of treatment measured by the PAR index was much better than the GDS, indicating higher treatment standards and more stringent diagnosis.

4 The outcome of treatment measured by the PAR index satisfied the established criteria for defined treatment standards in all respects.

ACKNOWLEDGEMENT

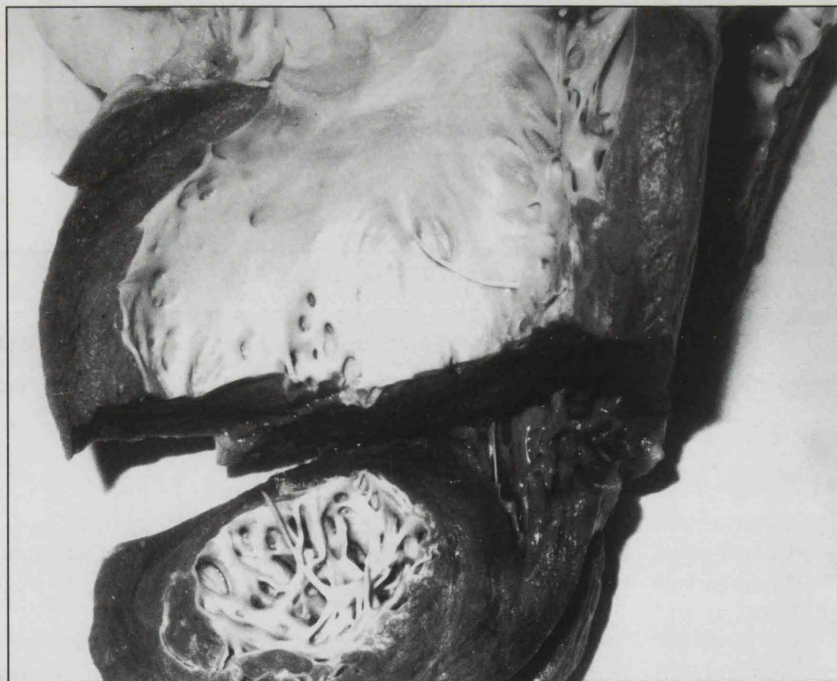
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QUIZ

An 11-year-old girl with Angelman syndrome developed cardiomyopathy which led to her death. At autopsy the heart was enlarged and the endocardium of the left ventricle was thickened and white (see figure).



1. What is Angelman syndrome?
2. Why is it important?
3. What is the cardiac condition?

Answers on page 58