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Can We Justify Combined Orthodontic and Orthognathic Surgery Treatment?

Abstract: Patients requiring combined orthodontic and orthognathic surgical treatment make up 7% of a UK-based Orthodontic Consultant's caseload. This has significant time and cost implications within the NHS. In a climate of spending cuts across our health service, a need has arisen to justify service provision. Accordingly, a new index has been devised to aid in the prioritization and provision of care for orthognathic patients.

CPD/Clinical Relevance: To carry out a retrospective audit of 44 patients who had orthognathic surgery in the NHS between May 2012 and October 2014, assign each an Index of Orthognathic Functional and Orthodontic Treatment Need, IOFTN and IOTN, score, respectively and identify any differences.

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Orthognathic surgery in combination with orthodontic treatment requires a significant time commitment from both the surgeon and orthodontist, constituting 7% of patients' treatment by UK-based Orthodontic Consultants.¹ Consequently, it also commands a great deal of funding from the NHS and, in a climate of spending cuts across our health service, a need has arisen to justify service provision.

Orthognathic surgery is defined as surgical treatment of various dental-facial deformities and anomalies. Included in this group are certain syndromes and conditions including:

- Cleft lip and palate;

- Obstructive sleep apnoea;
- Hemi-facial macrosomia;
- Condylar hyperplasia;
- Post-traumatic jaw deformities and associated malocclusions;
- Jaw deformities resulting in both functional and psycho-social difficulties.²

These patients often have associated malocclusions that are not amenable to orthodontic treatment alone and thus need a combined approach involving both orthodontic therapy and jaw surgery.

It is important that such patients are offered treatment, as there is a possibility of functional problems,

aesthetic concerns, as well as psychological and social integration issues. The impact of orthognathic surgery on quality of life has been demonstrated, as has the quality-adjusted life year (QALY). QALY is a measurement of the burden of disease and incorporates both the quality and quantity of life lived. In addition to this it assesses the value of any medical intervention.² This is often increased further as most patients undergoing such treatment are young and will therefore benefit from life-long effects of intervention.³

In 2007, Hunt and Cunningham undertook a systematic review, which showed that orthognathic patients

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<p>Grade 5 (Need treatment)</p> <p>5.i Impeded eruption of teeth (except for third molars due to crowding, displacement, the presence of supernumerary teeth, retained deciduous teeth and any pathological cause.</p> <p>5.h Extensive hypodontia with restorative implications (more than 1 tooth missing in any quadrant) requiring pre-restorative orthodontics.</p> <p>5.a Increased overjet greater than 9mm.</p> <p>5.m Reverse overjet greater than 3–5mm with reported masticatory and speech difficulties.</p> <p>5.p Defects of cleft lip and palate and other craniofacial anomalies.</p> <p>5.s Submerged deciduous teeth.</p>	<p>Grade 3 (Borderline need)</p> <p>3.a Increased overjet greater than 3–5mm but less than or equal to 6mm with incompetent lips.</p> <p>3.b Reverse overjet greater than 1mm but less than or equal to 3–5mm.</p> <p>3.c Anterior or posterior crossbites with greater than 1 mm but less than or equal to 2mm discrepancy between retruded contact position and intercuspal position.</p> <p>3.d Contacted point displacements greater than 2mm but less than or equal to 4mm.</p> <p>3.e Lateral or anterior open bite greater than 2mm but less than or equal to 4mm.</p> <p>3.f Deep overbite complete on gingival or palatal tissues but no trauma.</p>
<p>Grade 4 (Need treatment)</p> <p>4.h Less extensive hypodontia requiring/prequiring preresorative orthodontics or orthodontic space closure to obviate the need for a prosthesis.</p> <p>4.a Increased overjet greater than 6mm but less than or equal to 9mm.</p> <p>4.b Reverse overjet greater than 3.5mm with no masticatory or speech difficulties.</p> <p>4.m Reverse overjet greater than 1mm but less than 3–5 mm with recorded masticatory and speech difficulties.</p> <p>4.c Anterior or posterior crossbites with greater than 2mm discrepancy between retruded contact position and intercuspal position.</p> <p>4.l Posterior lingual crossbite with no functional occlusal contact in one or both buccal segments.</p> <p>4.d Severe contact point displacements greater than 4mm.</p> <p>4.e Extreme lateral or anterior open bites greater than 4mm.</p> <p>4.f Increased and complete overbite with gingival or palatal trauma.</p> <p>4.t Partially erupted teeth, tipped and impacted against adjacent teeth.</p> <p>4.x Presence of supernumerary teeth.</p>	<p>Grade 2 (Little)</p> <p>2.a Increased overjet greater than 3–5mm but less than or equal to 6mm with competent lips.</p> <p>2.b Reverse overjet greater than 0mm but less than or equal to 1mm.</p> <p>2.c Anterior or posterior crossbite with less than or equal to 1mm discrepancy between retruded contact position and intercuspal position.</p> <p>2.d Contact point displacements greater than 1mm but less than or equal to 2mm.</p> <p>2.e Anterior or posterior open bite greater than 1mm but less than or equal to 2mm.</p> <p>2.f Increased overbite greater than or equal to 3–5mm without gingival contact.</p> <p>2.g Pre-normal or post-normal occlusions with no other anomalies (includes up to half a unit discrepancy).</p> <p>Grade 2 (Little)</p> <p>1. Extremely minor malocclusions including contact point displacements less than 1mm.</p>

Figure 1. The IOTN Dental Health Component.

experienced psychological benefits, including improved self-confidence, body and facial image and social adjustment, as a result of treatment.⁴ A more recent systematic review by Alanko *et al* also noted that orthognathic treatment resulted in improvements in well-being.⁵ Although there are aesthetic concerns that motivate patients to undergo such surgery, some studies found that functional problems were the primary factor in motivating treatment.

Indices are used to facilitate better understanding of aetiology, risk, prognosis and outcome of a treatment, as well as serving as a tool to determine

prevalence. Increasingly, indices are implemented to help with planning and projection of publicly funded services, thus prioritizing treatment to those that both need it and are likely to benefit from treatment. Currently, the most commonly used indices in Orthodontics are the IOTN, ICON and PAR. In addition to this, many orthodontists and maxillofacial surgeons will be aware of a number of indices for assessing the severity of malocclusions associated with cleft lip and palate patients, namely; the GOSLON yardstick, Five-Year-Old, Bauru-Bilateral Cleft Lip and Palate yardstick, Huddart-Bodenham, Modified Huddart-Bodenham, EUROCRAN yardstick,

and GOAL yardstick.⁶

Essentially, five types of indices exist:

1. Diagnostic;
2. Epidemiologic;
3. Treatment need/Treatment priority;
4. Treatment outcome; and
5. Treatment complexity.

Currently, the IOTN exists in orthodontics to limit access to NHS Orthodontics and prioritize treatment provision to patients most likely to benefit from orthodontic intervention. The IOTN was developed by Brook and Shaw⁷ to assess treatment needs. They also developed the Peer Assessment rating

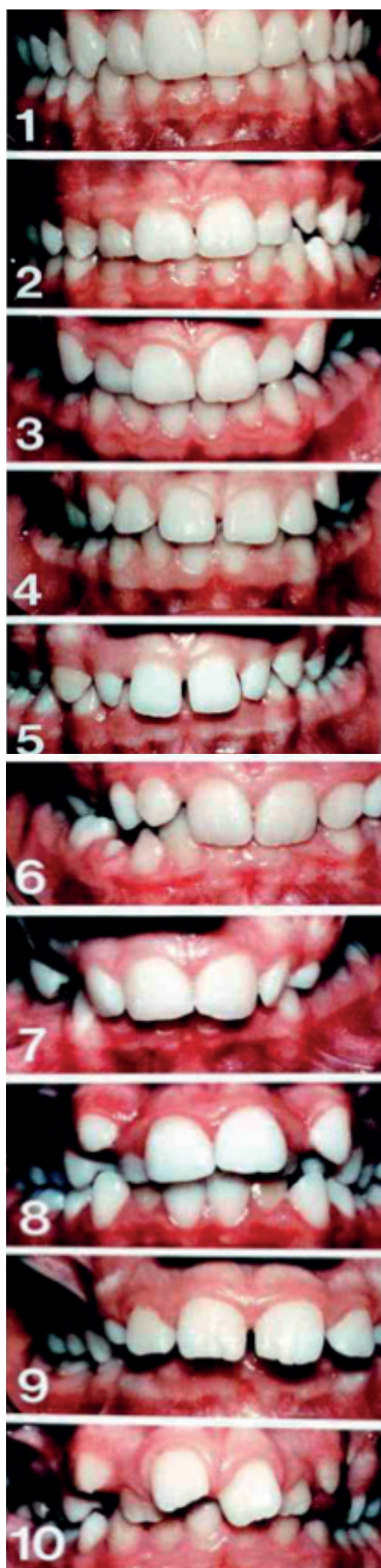


Figure 2. The IOTN Aesthetic Component.⁹

5. Very Great Need for Treatment

- 5.1 Defects of cleft lip and palate and other craniofacial abnormalities
- 5.2 Increased overjet > 9mm
- 5.3 Reverse overjet \geq 3mm
- 5.4 Open bite \geq 4mm
- 5.5 Complete scissors bite affecting whole buccal segment(s) with signs of functional disturbance or occlusal trauma
- 5.6 Sleep apnoea not amenable to other treatments such as MAD or CPAP (as determined by sleep studies)
- 5.7 Skeletal anomalies with occlusal disturbance as a result of trauma or pathology

4. Great Need for Treatment

- 4.2 Increased overjet \geq 6mm and \leq 9mm
- 4.3 Reverse overjet \geq 0mm and < 3mm with functional difficulties
- 4.4 Open bite < 4mm with functional difficulties
- 4.8 Increased overbite with evidence of dental or soft tissue trauma
- 4.9 Upper labial segment gingival exposure \geq 3mm at rest
- 4.10 Facial asymmetry associated with occlusal disturbance

3. Moderate Need for Treatment

- 3.3 Reverse overjet \geq 0mm and < 3mm with no functional difficulties
- 3.4 Open bite < 4mm with no functional difficulties
- 3.9 Upper labial segment gingival exposure < 3mm at rest, but with evidence of gingival/periodontal effects
- 3.10 Facial asymmetry with no occlusal disturbance

2. Mild Need for Treatment

- 2.8 Increased overbite but no evidence of dental or soft tissue trauma
- 2.9 Upper labial segment gingival exposure < 3mm at rest with no evidence of gingival/periodontal effects
- 2.11 Marked occlusal cant with no effect on the occlusion

1. No Need for Treatment

- 1.12 Speech difficulties
- 1.13 Treatment purely for TMD
- 1.14 Occlusal features not classified above

Figure 3. The Index of Orthognathic Functional Treatment Need (IOFTN).¹⁰

(PAR) to evaluate treatment outcome. Shaw *et al* stated that using such indices would offer a number of advantages, such as uniformity in prescribing patterns, safeguards for the patient, patient counselling, as well as monitoring and promoting standards.⁸

This index ranks malocclusions in terms of the significance of various occlusal traits and assigns them a grade based on the single worst feature, with the aim of identifying those most likely to benefit from treatment. This index comprises two parts:

1. The dental health component (IOTN DHC) (Figure 1), which measures and categorizes severity of various occlusal traits in order of severity, and

2. The aesthetic component (IOTN AC) (Figure 2), which aims to measure the level of dental attractiveness.⁸

The IOTN DHC is based on a 5-point scale grading malocclusions from 1 to 5 based on various occlusal features, with 1 being no need, 3 being borderline and 4 and 5 great need for treatment. The IOTN AC is a series of 10 graded photographs of various malocclusions of various aesthetic compromises which are best matched by both the clinician and patient to the patient's teeth purely in terms of aesthetics. Currently, patients with an IOTN grade of 4 or 5, or with a grade 3 and Aesthetic Component grade above 6, are eligible for treatment under the NHS. For combined surgical and orthodontic

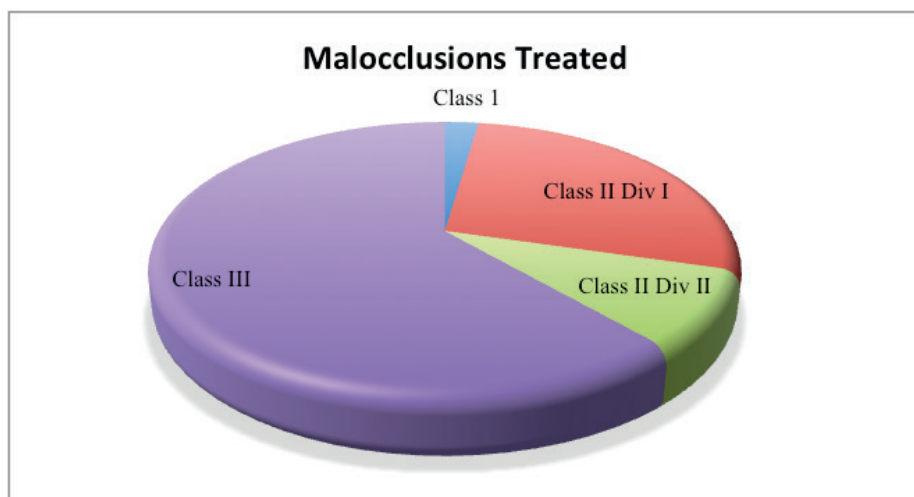


Figure 4. The distribution of malocclusions treated

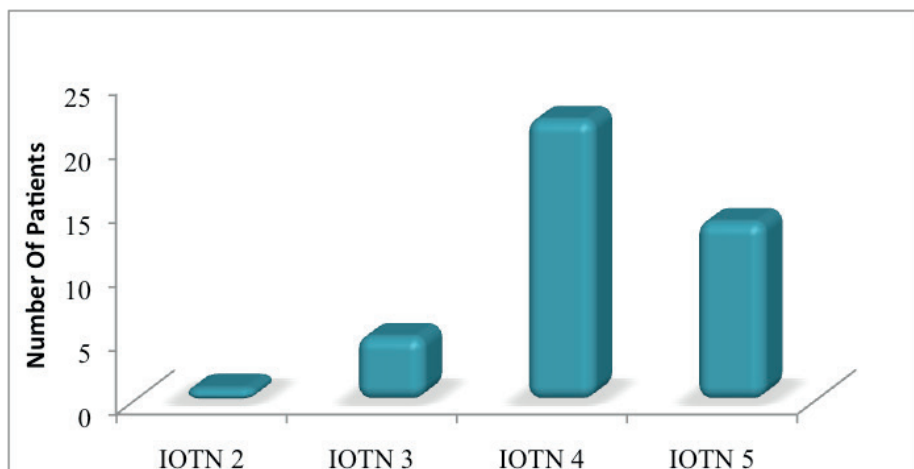


Figure 5. Patients' IOTN scores.

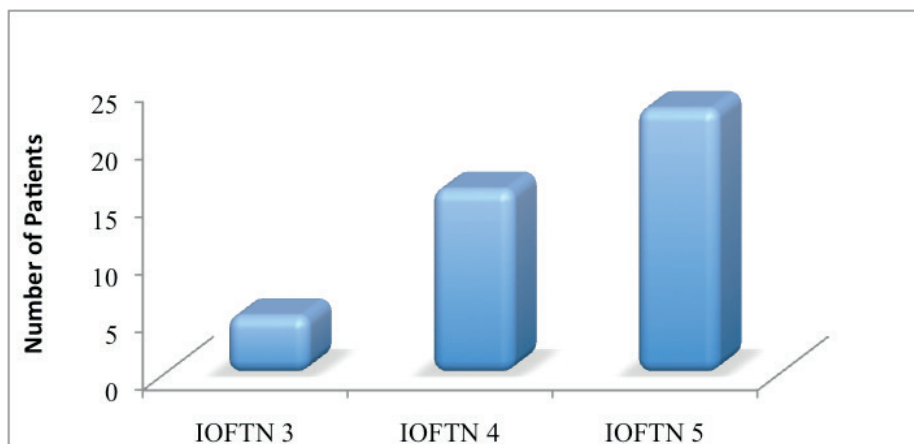


Figure 6. Patients' IOFTN scores.

patients, however, there is no indication for functional need for treatment, thus patients requiring orthodontic and surgical intervention may not actually score high enough on the IOTN to qualify for treatment.

With such shortfalls in mind, an index based on the IOTN has

been developed known as the Index of Orthognathic Functional Treatment Need (IOFTN).¹⁰ The IOFTN applies to patients with malocclusions that are not amenable to orthodontic treatment alone due to skeletal deformity and prioritizes them in accordance to treatment need. Furthermore, it is intended for use in

conjunction with psychological and clinical indicators as it only relates to the functional need for treatment.² As with the IOTN DHC, the IOFTN is based on a 5-point scale. When designing the IOFTN, four experienced consultant orthodontists used the IOTN DHC as a basis for developing this new index.⁸

It is hoped that the use of this index will prevent orthognathic surgery being classified as a low priority treatment and have funding withdrawn. Furthermore, this index will help to provide treatment for some skeletal deformities that do not score high enough on the IOTN currently to qualify for treatment.

Aims

The aim of this study was to assess whether our cohort of patients undergoing combined orthodontic and orthognathic surgery treatment would have qualified for orthognathic surgery according to the new index produced, the Index of Orthognathic Functional Treatment Need (IOFTN). Furthermore, this study is to assess its ease of use, the difference between the IOTN and the IOFTN and whether this new Index is worth introducing to our daily practice in hospital orthodontic departments. Additionally, the study was:

- To carry out a comparison of the IOTN and the IOFTN on the same 44 patients who had combined orthodontic and orthognathic surgery treatment in NHS between May 2012 and October 2014;
- To identify any differences in the IOTN/IOFTN for the same malocclusions;
- To determine if a patient's IOFTN placed him/her in a higher need for treatment category.

Materials and methods

This was a retrospective study of 44 patients who underwent, and are currently undergoing, combined orthodontic and orthognathic treatment in Lanarkshire. Each patient's IOTN was taken from his/her initial orthodontic assessment and, using the criteria set out with the IOFTN, an IOFTN grade was assigned to each patient according to the criteria outlined in Figure 3.

Results

In total, 44 patients were assessed, 24 males and 20 females. The majority of patients (61%) were skeletal Class III, 36% were Class II (27% Class II division 1 and 9% Class II division 2), and

2% Class I (Figure 4). Using the IOTN, 90% of patients were in a high need for treatment, changing to 98% using the IOFTN (Figures 5 and 6). Nine patients' treatment need increased when using the IOFTN, although this only moved them from a Category 4 to 5, thus no real difference in need as both grades would qualify. For two patients, however, the IOFTN placed the patient in a greater treatment need category from a borderline need, however, the aesthetic component would have justified intervention anyway.

Discussion

It would be unrealistic to expect a single index to fit all the patients that we treat, therefore this new index should be welcomed as another tool to assess our patients. This study has shown that the majority of our patients are already high priority. However, using the IOFTN confirms this as a means of identifying such need to funding bodies. Furthermore, as the IOFTN is very similar in structure to the IOTN, those familiar with using the IOTN will find the IOFTN an easy and natural process.

It is surprising, however, that orthognathic surgery is under scrutiny and it is at risk of funding being cut, or even stopped in some regions. It has been shown that orthognathic surgery is in fact very good value for money, especially when compared to more common procedures, such as knee and hip replacements. Orthognathic surgery is said to improve quality of life greatly as there is a strong correlation with facial deformity and psychological and psychosocial problems which have been shown to have improved following orthognathic surgery. To class such treatment as purely aesthetic surgery is also unrealistic, as many of these patients have associated occlusions that impact upon function, leading to problems with mastication and even sleep apnoea.

This also brings about the question as to whether we truly have a National Health Service if such regional discrepancies exist across the country between Health Boards.

Conclusion

These results show that, in NHS Lanarkshire, those patients receiving orthognathic surgery can be classified as a high need for treatment according to the IOFTN. This helps

to justify the service and helps with maintaining funding in this area. As this new index is being introduced into England, it is likely that it will travel north of the border and affect Scotland too.

As the results show, the need for treatment is not greatly different when using either index. However, the main difference exists for this cohort of patients in that it is specifically designed for those undergoing orthodontic treatment in combination with orthognathic surgery, something that the IOTN was not intended to incorporate. This index is more likely to stand the test of time as it does not greatly change need for treatment but is more specific when justifying it, an element that is likely to be of benefit when incorporating it into our publicly funded health service.

The index is likely to be welcomed, as it is familiar, due to its similarity with the IOTN, and simple to use. It is beneficial for audit purposes and, furthermore, classifies the patients who we deem are in need of surgical intervention but score low on the IOTN and thus do not technically qualify for combined treatment.

The IOFTN should become part of each assessment form, thus making the transition simple when or if it is introduced. Early adoption of this procedure would help identify any pitfalls with this index, which could potentially be rectified prior to its widespread introduction. Furthermore, as this is true combined care treatment, the IOTN (both DHC and AC) should still be implemented as these patients often have a number of treatment options and do not always wish to proceed with the full treatment package, thus comprehensive records from both specialties are required.

Currently, courses exist for calibrating operators in the use of the IOTN to ensure consistency. These, however, do not exist for the use of the IOFTN. Organizing some form of calibration would give greater validity and would enable objective comparisons across the UK. The study published for the IOFTN showed very good intra-examiner agreement and good validity, thus one would expect a calibration course or workshop would be beneficial to both orthodontists and surgeons.⁶

Conflicts of interest

None of the authors of this

paper has any conflicts of interest.

References

- Dunbar C, McIntyre G, Laverick S. Orthodontic treatment and orthognathic surgery – Do we predict the length of treatment accurately? *Br Orthod Soc Clin Effect Bull* 2013; **31**: 8–9.
- <https://www.rcseng.ac.uk/healthcare-bodies/docs/published-guides/orthognathic>
- Cunningham SJ, Sculpher M, Sassi F, Manca A. A cost-utility analysis of patients undergoing orthognathic treatment for the management of dentofacial disharmony. *Br J Oral Maxillofac Surg* 2003; **41**: 32–35.
- Hunt NP, Cunningham SJ. The influence of orthognathic surgery on occlusal force in patients with vertical facial deformities. *Int J Oral Maxillofac Surg* 2007; **26**: 87–91.
- Alanko OM, Svedström-Oristo AL, Tuomisto MT. Patients' perceptions of orthognathic treatment, well-being, and psychological or psychiatric status: a systematic review. *Acta Odontol Scand* 2010; **68**: 249–260.
- Altalibi M, Saltaji H, Edwards R, Major PW, Flores-Mir C. Indices to assess malocclusions in patients with cleft lip and palate. *Eur J Orthod* 2013; **35**: 772–782.
- Brook P, Shaw WC. The development of an index of orthodontic treatment priority. *Eur J Orthod* 1989; **11**: 309–320.
- Shaw WC, Richmond S, O'Brien KD, Brook P, Stephens CD. Quality control in orthodontics: indices of treatment need and treatment standards. *Br Dent J* 1991; **170**: 107–112.
- Richmond S. *Evaluating Effective Orthodontic Care*. Cardiff: First Numerics Ltd, 2014: pp15–16.
- Ireland AJ, Cunningham SJ, Petrie A, Cobourne MT, Acharya P, Sandy JR, Hunt NP. An Index of Orthognathic Functional Treatment Need (IOFTN). *J Orthod* 2014; **41**: 77–83.