

Primary surgery effect on dental arch relationships of patients born with unilateral cleft lip and palate using the GOSLON yardstick index

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ABSTRACT

Objectives

To score dental arch development using the Great Ormond Street, London, and Oslo (GOSLON) yardstick index, following primary surgery in patients with a complete unilateral cleft lip and palate (UCLP), and to compare the outcome score with the GOSLON score of Cleft Care UK (CCUK) as well as with the Clinical Standards Advisory Group (CSAG), United Kingdom.

Methods

Study models of patients (average age 12 years) with a non-syndromic complete UCLP, who had been surgically treated at the University of Pretoria Facial Cleft Deformity (UPFCD) clinic. They were assessed using the GOSLON yardstick index by certified raters from the Dental School in Dundee, Scotland. The mean outcome ratings were calculated from the scoring of 27 sets of plaster models. The other scoring rounds were used to calculate intra- and inter-observer agreement using Cohen's weighted kappa and Fleiss's multi-rater kappa.

Results

There were strong intra- and inter-observer agreement, with a weighted kappa of 0.92. The Facial Cleft Deformity (FCD) clinic data showed a good treatment outcome with a mean GOSLON rating of 2.85 compared to a rating of 3.2 for the CSAG and 2.62 for the CCUK cohort studies.

Conclusion

The UPFCD clinic primary surgical protocol displayed a good treatment outcome rating, in line with that of the CCUK cohort and better than the CSAG results.

Keywords

Cleft in Africa, Cleft audit, cleft outcome, plaster models.

INTRODUCTION

Despite the advances in the surgical management of patients with facial cleft deformities (FCDs), there are still many controversies regarding the ideal primary surgical protocols for such deformities.¹⁻² Consequently, there is a constant need to assess treatment outcomes of patients treated for cleft lip and palate (CLP) defects to monitor and implement the highest possible standards of care, thus improving treatment protocols for future patients.³

Cleft centres in Europe and America have conducted multi-centre studies, for example, Eurocleft and Americleft, both of which resulted in changes being made to the delivery of cleft care.⁴ Although clinical audits have been implemented in different parts of the world,⁵ have not yet been carried out in Pretoria, South Africa. This is a collaborative project established under the guidance of the Dental School in Dundee, Scotland. It is an audit for the current primary surgical treatment outcome of the UPFCD clinic.

LITERATURE REVIEW

FCDs represent the largest group of craniofacial deformities of the oral structures, with CLP being the most common.⁶ In South Africa, CLP defects incidence is approximately 1.38 per 1 000 for the white and 0.42 per 1 000 for the black population groups.⁷

Facial growth is one of the key areas of interest for assessing the quality of cleft treatment outcomes.⁸ Ensuring good facial growth may result in dental arch relationships that can be treated conventionally. Surgical correction of the skeletal bases is avoided, thus providing optimal re-

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sults regarding function and facial appearance. It also minimises costs to the patients and health care providers, which consequently lessens the caregiver's burden.^{4,9}

The World Health Organization (WHO), in its report "Global strategies to reduce the healthcare burden of craniofacial anomalies," recommended international collaborative research on craniofacial anomalies and issued guidelines for clinical management of patients with CLP.¹⁰⁻¹¹

These guidelines have been followed in Europe, North America and other parts of the world. As a result, these regions implemented baseline standards of cleft care with recommendations on improving the quality of cleft services.² In Africa, there are many gaps in the knowledge and assessment of the treatment outcome of CLP care due to the shortage of multidisciplinary cleft care services and cleft specialists.¹²

The UPFCD clinic was established in 1983 and is the largest in Africa.¹³ The clinic is an ideal setting to conduct studies due to the high volume of patients, ethnic diversity, and retrospective records availability.¹⁴

Treatment outcome studies allow for comparison between different centres and help provide evidence of cleft care success.¹⁵ These studies also encourage co-operation and collaborative work.³ Given the potential impact of primary surgical protocols on dentofacial growth and development, one of the most noteworthy findings of the Eurocleft study was the ability to detect differences in dental arch relationships using a simple, yet popular, outcome measure, namely the Great Ormond Street, London, and Oslo (GOSLON) Yardstick.¹⁶

The yardstick offers a reliable means of measuring dentofacial relationships,¹⁷ using a set of dental study models arranged in five groups from the very best dental arch relationships in unilateral CLP subjects (GOSLON Group 1) to the worst (GOSLON Group 5) (Fig. 1).



Figure 1. GOSLON Yardstick Index.

Cases falling into Groups 4 and 5 are generally considered so severe that they are beyond orthodontic correction alone and require surgical involvement (Table 1).¹⁵

Table 1. GOSLON five group's description.

Group	Description	Long-term outcome
Group 1	Positive overjet with average inclined or retroclined incisors with no crossbite or open bite.	Excellent
Group 2	Positive overjet with average inclined or proclined incisors with unilateral crossbite or crossbite tendency with or without open bite tendency around the cleft site.	Good
Group 3	Edge-to-edge bite with average inclined or proclined incisors or reverse overjet with retroclined incisors. Unilateral crossbite with or without open bite tendency around the cleft site.	Fair
Group 4	Reverse overjet with average inclined or proclined incisors. Unilateral crossbite with or without bilateral crossbite tendency with or without open bite tendency around the cleft site.	Poor
Group 5	Reverse overjet with proclined incisors, bilateral crossbite, and poor maxillary arch form and palatal vault anatomy.	Very poor

Numerous studies have been conducted using this measure.^{4,16,18} They find GOSLON rating is a reliable, rapid, and clinically valid means of assessing dental arch relationships in patients with UCLP defects. The GOSLON rating is used to provide an audit for primary surgical outcomes and thereby identifies procedures that may need to be changed to improve the treatment outcome.¹⁹ For this reason, the present study was undertaken to follow the worldwide cleft centres' effort to improve CLP care by monitoring the CLP treatment outcome.

OBJECTIVES

The study objective is to assess the effect of the CLP primary surgery protocol of the UPFCD clinic on the dental arches' relationship, using the GOSLON index rating.

METHODS

Ethics approval was obtained from the Research Ethics Committee of the University of Pretoria's Faculty of Health Sciences. The sample of 27 consecutively treated patients (average age 12 years with non-syndromic complete UCLP had not received any active orthodontic treatment. All patients in the sample had their primary surgery protocol performed by the same surgeon at the UPFCD clinic.

The plaster study models collected as part of the routine clinical records appointments were duplicated and sent to the Cleft Lip and Palate Centre at the Dental School in Dundee, Scotland. All models were trimmed in the same manner to eliminate bias and ensure that the assessors could not identify from which institution the models were sent. Numbers were randomly assigned to each model and marked in pencil. No other means of identification was recorded. In addition, matching clinical records sourced from the archives and details such as diagnosis, treatment planning, surgical interventions protocol, and treatment outcomes were recorded.

Data analysis

The GOSLON index was used for each study model, and it was analysed and rated by a blind panel at the Dental School in Dundee, using standardised rating schemes. Examiners were calibrated and went through repeatability and reliability tests to ensure the consistency of recordings.

Statistical methods

The Linear Weighted Kappa statistic and Kendall's Co-efficient of Concordance statistic were used to determine agreement levels within and between raters.

RESULTS

There were a strong intra- and inter-rater agreement, with a weighted kappa of 0.92 indicating a very good Kappa values category (Table 2).

Value of K	Strength of agreement
<0.20	Poor
0.21 – 0.40	Fair
0.41 – 0.60	Moderate
0.61 – 0.80	Good
0.81 – 1.00	Very good

The distributions of the GOSLON score for each centre are shown in Fig. 2.

The mean GOSLON score of the UPCFD clinic was 2.85, which is better than the 3.2 for the CSAG and similar to the CCUK cohort studies of 2.62 (Fig. 3).

DISCUSSION

Treatment outcome audit

In agreement with Shaw et al.² and Asher-McDade, Roberts, C. ShawGallager 20 clinical audit and quality assurance to monitor cleft treatment outcome are regarded as a requirement to take remedial action for any treatment shortcomings.

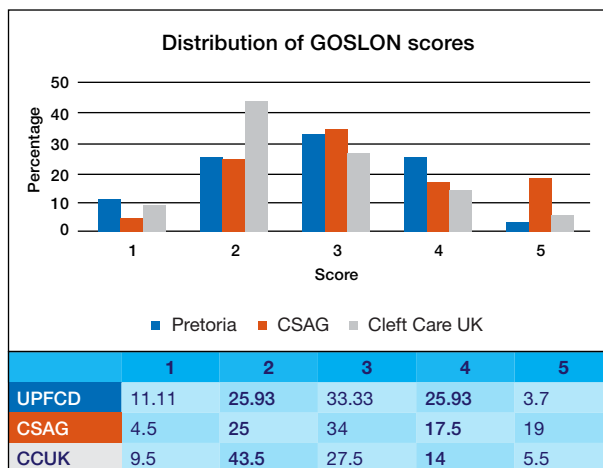


Figure 2. Distribution of GOSLON scores between UPFCD, CSAG, and CCUK.

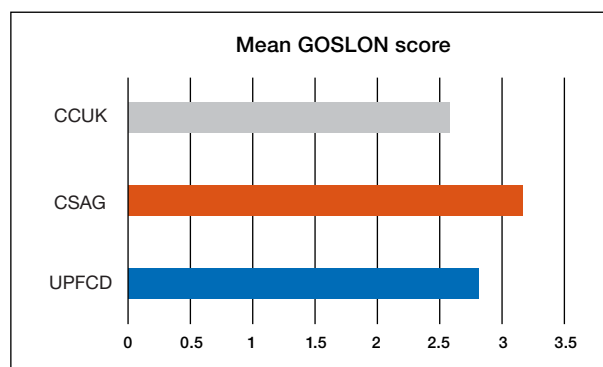


Figure 3. Mean GOSLON scores of UPFCD CSAG and CCUK.

The reason for choosing the GOSLON yardstick index

Assessment of primary cleft surgery's effect on midfacial growth (consequently on the dental arch relationships) is an accepted method.²¹ Different indices have been developed based on scoring the dental arch relationship.²²⁻²⁶

From all different indices, the GOSLON yardstick index was chosen to score the sample due to its widespread acceptance and to allow multicentre score comparison.²⁷

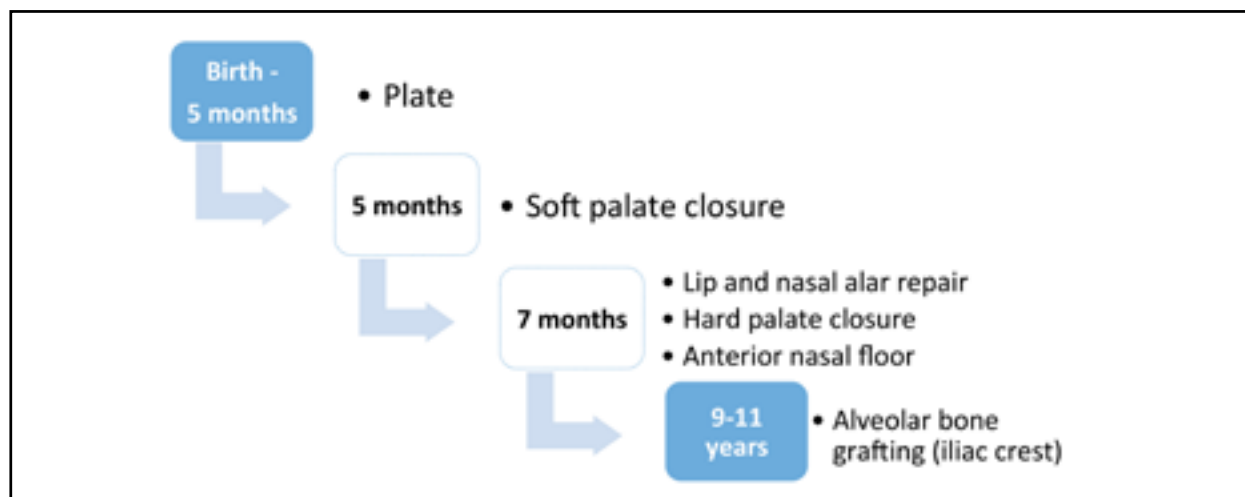


Figure 4. Surgical treatment protocol for UCLP applied to the study sample.

Treatment protocol

The UCLP care protocol of the UPFCD clinic (Fig. 4) consists of a pre-surgical infant orthopaedic (PSIO) plate inserted at age one to two weeks to assist with feeding and speech development to facilitate primary surgery.²⁸⁻³² At the age of five months, the soft palate is closed and the hard palate at seven months. Alveolar bone grafting is done at ages 9 to 11 years, using harvested bone from the iliac crest.

The UCLP primary surgery protocol includes two-stage palatal closure and delayed lip closure to assist with an intelligible speech before the child articulates and minimises the negative effect on midfacial growth (in agreement with Hollmann,³³ Precious, Goodday, Morrison, Davis³⁴). This contrasts with Lilja, Mars, Elander, Enocson, Hagberg, Worrell,³⁵ who delayed hard palate closure after three years.

This study found that the hard palate's closure at age seven months did not lower the GOSLON rating. This is in line with the findings of Peterson-Falzone³⁶ and Willadsen, Boers, Schöps, Kisling-Møller, Nielsen, Jørgensen.³⁷ This study showed that surgery outcomes using different surgical protocols achieved similar GOSLON ratings.³⁸

CONCLUSION

The UPFCD clinic displayed good treatment outcomes comparable to those of the CCUK cohort and the Americleft Study Centre C. This study outcome suggests that the clinical treatment protocol at UPFCD is an effective strategy for treating patients with UCLP regarding favourable maxillary development. Future research is recommended to continue monitoring the UPFCD surgical treatment outcomes and participate in multicentre studies.

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