# 3D ASYMMETRY OF CHILDREN WITH BCLP

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## Aim

- To assess three dimensional (3D) facial asymmetry within and between children with bilateral cleft lip and palate (BCLP) in comparison to sex/age matched control group.

## Introduction

Facial soft tissue asymmetry is a 3D feature and is a common finding in nature. Facial asymmetry is more pronounced in individuals with oral clefts. Several studies have investigated the extent of asymmetry employing: direct linear measurements, constructed facial midline plane to bisect the binocular width and nasal bridge, and Procrustes analysis for scoring landmark configuration asymmetry without getting a numeric value. The use of a constructed midfacial plane could not be considered ideal in the assessment of facial asymmetry in individuals with craniofacial deformities where asymmetry is considered one of the main clinical findings.

Recently, Bugaighis et al. reported a novel method of quantifying facial asymmetry in male and female subjects without clefts by applying generalized Procrustes analysis to best fit an original 3D image scan and a reflected 3D image. The distance was quantified in millimetres (mmms) between the original and reflected landmarks.

## Method

3D facial images were captured from 19 children aged 8 to 12 years with non syndromic BCLP attending the RVI based cleft lip and palate clinics in the north east of England and 80 age/Sex matched control group attending the Paedodontic and Orthodontic clinics at Newcastle Dental Hospital.

The images were acquired at rest using 3D Stereophotogrammetry (3DMD, Atlanta, USA). Each Scan was registered using MorphAnalyser software. 37 landmarks were identified in each image; 11 midasgittal and 13 paired landmarks (Figure 1). The x, y, z coordinates of each landmark were extracted automatically. The asymmetry of facial landmarks was assessed by superimposing the reflected and the original images by translating, rotating and scaling the two images to best fit with retaining their shape. The distance between each landmark and its correspondent reflection was measured in mm and the landmark asymmetry was calculated for each landmark.

SPSS version 17.0 was used for data analysis. Non-parametric tests (Mann-Whitney) were applied to detect significant asymmetric differences between the controls and the BCLP group.

## Results

The BCLP face showed a significant degree of asymmetry especially in the nasolabial region compared to controls (Table 1 and Table 2). Eighteen out of 24 landmarks were significantly asymmetric in the BCLP group (Figure 2).

In the upper face, the only significant asymmetric difference between the controls and the BCLP group was observed in the inner ocular contour surface (en) at p=0.006 (Figure 2).

All the BCLP nine recorded nasal landmarks were asymmetric compared to the controls (p<0.003). Moreover, the BCLP upper lip and philtrum surface were more asymmetric (p<0.003), except for the superior labial sulcus (sls) and labialis superior (ls) landmark where the asymmetry was similar in both groups.

The BCLP six recorded oral landmarks (mean asymmetry of 1.11mm) were greatly asymmetric compared to the corresponding controls landmarks at 0.51mm. All these differences were statistically significant (p<0.006) except for the ls landmark.

Significant asymmetric differences were noticed in the BCLP lower facial landmarks (p<0.006). The recorded landmarks (mean asymmetry of 0.91mm) were more asymmetric than in the control (mean asymmetry of 0.38mm at p<0.006. However, the aural landmark’s asymmetry was similar in both the BCLP and control faces.

## Discussion

In the present study, 3D facial asymmetry was assessed by quantifying (in mmms) the distance between each landmark and the corresponding reflected point without relying on a symmetrical facial plane. This allowed the assessment of the contribution of each facial region to the overall facial asymmetry.

Facial asymmetry was significantly more pronounced in the BCLP group compared with the control group. In the nasolabial region, paired landmarks were more asymmetric than the midline landmarks. This might suggest that the surgical repair had enhanced the symmetry in the bilateral asymmetrical deformity.

The examined subjects were operated prior to the implementation of the CSAG recommendation (1998). Five plastic surgeons using different techniques operated on the subjects and due to the retirement of some of the surgeons as well as poor documentation at that time it was not possible to identify the lip and palate repair protocols. It would be interesting to explore facial asymmetry in subjects with BCLP who were operated after the implementation of the CSAG recommendations using the same technique and compare the results with the present finding.

## Conclusions

- There is significant differences in 3D landmark asymmetry between subjects with BCLP and the control group.
- Shape analysis shows promise in clinical evaluation of oral cleft deformity and surgical repair outcome.

## References