

# Laterality and Gender in Congenital Upper Limb Deficiencies

Meenakshi Nayar<sup>1,2\*</sup>, Roxana Vanderstay<sup>2</sup> and Imad Sedki<sup>1</sup>

<sup>1</sup>Prosthetic Rehabilitation Unit, Royal National Orthopaedic Hospital, Stanmore, London

<sup>2</sup>Cicely Saunders Institute, King's College, London

\*Corresponding Author: Meenakshi Nayar, Prosthetic Rehabilitation Unit, Royal National Orthopaedic Hospital, Stanmore, London, Tel: +44 (0)20 7836 5454, E-mail ID: meenakshi.nayar@nhs.net

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## Introduction

Laterality and gender in congenital upper limb deficiencies have been an area of debate in prosthetics for many years. Images such as the 'Limbless children, Moscow' in 1993 by Gerd Ludwig in the National Geographic showed a line of 8 children, all with left sided congenital upper limb deficiency. The line consisted of 6 girls and two boys. Did this picture depict what has been considered by the experts to be true when it comes to congenital upper limb deficiencies – It is more common on the left side and more common in females? (Figure 1).

## Background

A bias towards more left upper limb congenital absences has been commented on in a number of papers in the late 90's [1-4]. There appeared to be no conclusive explanation for this preponderance. A paper by Corballis and Morgan [5] in 1979 suggested that the developing embryo is under the influence of a left-right maturational gradient which seems to favour earlier or more rapid development on the left than the right. Another theory by Brown et al. [6] suggests that the asymmetric development of the cardiovascular system leads to subtle differences in vessels serving the left and right limbs and that the explanation for the mechanism of induction of unilateral limb defects may lie in the vascular supply to the limbs.

## Previous studies

A UK national disablement services centre (DSC) analysis in 1998 looked at the number of patients with a unilateral upper limb congenital deficiency who were registered at the centres, differentiated by side of absence, gender and age group (15

years and below and 16 years and above) [7]. This study mainly concentrated on the demographic registered with the DSC but showed a slight but non-significant tendency towards a higher percentage of left sided absences in the 16+age group. When the data was categorised by gender, there were significantly more males than females. It was also noted that in the 16+ age group there were a significantly higher percentage of females with a left sided absence.

## Up to date UK wide analysis

To explore this further we looked at the most recent national level incident data for congenital anomalies referred to prosthetic centres in England in 2011/2012 representing a total of 146 cases [8]. Age in this report was classified as <15 years and over 15 years. When we analysed the data we found no relation between laterality and age group (<15 years and over 15 years). In the national data the number of males was larger 98 (67.1%) to females (32.8%). Females seem to have a tendency to have the anomaly on the left side 32/48 (66.6%) vs 47/98 (47.9%) in males, with a statistically significant difference at  $p < 0.05$  ( $\lambda 24.54$ ,  $df=1$ ,  $p=0.033$ ).

## Discussion

The results at the national level reflect previous data by Fraser, in relation to the preponderance of males in the study sample and the presence of the left sided anomalies in females. This is a very interesting area of research. Our purpose with carrying out this analysis was to reinvigorate interest in the incidence and epidemiology of congenital upper limb deficiencies and welcome a debate from professionals working in prosthetics.



**Figure 1:** Limbless children, Moscow' in 1993 by Gerd Ludwig in the National Geographic.

## Declaration of Interest

The authors reports no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

## Ethical Issues

None.

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