



## Emmanuel JK Adu\* and Peter Donkor

Department of Surgery, School of Medical Sciences,  
College of Health Sciences, Kwame Nkrumah  
University of Science and Technology, Kumasi,  
Ghana

**Dates:** Received: 30 January, 2017; Accepted: 23  
February, 2017; Published: 24 February, 2017

**\*Corresponding author:** Dr. Emmanuel J.K. Adu,  
Department of Surgery, Komfo Anokye Teaching  
Hospital, P.O. Box 1934, Kumasi, Ghana, E-Mail:  
aduemmanuel@hotmail.com

**Keywords:** Cleft lip; Cleft palate; Millard; Palatoplasty;  
Primary rhinoplasty

<https://www.peertechz.com>

## Research Article

# Management of Cleft Lip and Palate: A Five Year Review

## Abstract

**Introduction:** Clefts of the lip may cause cosmetic and social problems. Clefts of the palate may affect feeding, speech and hearing.

**Objective:** To document the clinical and epidemiological features, surgical techniques (Millard's repair for cleft lip, and the Oxford palatoplasty for cleft palate) and the outcome of treatment of patients with cleft lip and palate at Komfo Anokye Teaching Hospital (KATH), Kumasi, between January 2010 and December 2014.

**Patients and Methods:** Data on cleft patients were retrieved from the records of the cleft clinic and theatre records at KATH and analysed.

**Results:** From January 2010 to December 2014, 150 patients were treated for clefts. Their ages ranged from 0.25 to 25 years, mean age of 12 months with standard deviation of 14.5

The commonest deformity (85, N=150) was combined cleft lip and palate. Isolated cleft palate was the least common (23, N=150). There was predominance (83%) of unilateral cleft lip, 46% were left sided, 71% were complete. Unilateral cleft lip was repaired by Millard's rotation-advancement technique; bilateral cleft lip with Millard's one stage repair (Mulliken's modification). Both included closed primary rhinoplasty. Cleft palate was repaired with single stage palatoplasty with intravelar veloplasty - the Oxford palatoplasty.

Complications include failed endotracheal intubation (5 patients), partial gaping of lip repair (5), complete disruption of cleft palate repair (4).

**Conclusion:** Combined cleft lip and palate was the commonest cleft deformity. Most patients were one year or younger. Millard's techniques with primary rhinoplasty provided acceptable aesthetic and functional result. Adequate pre-surgical preparation is a requirement for successful cleft palate repair.

## Introduction

A cleft of the lip, with or without a cleft palate is a grotesque deformity which causes embarrassment to parents. Older children with clefts have concerns relating to teasing and behavioral problems. Some parents may experience feelings of sadness, guilt, anger and fear for their child's future social acceptance [1].

The child with a cleft palate cannot speak normally, is likely to suffer from earache and deafness, may leak food and fluids through the nose, and may suffer from malnutrition as a result of an inability to feed properly [2]. It is imperative that surgical treatment to make the patients anatomically, functionally and aesthetically as near normal as possible be performed as soon as the patients are fit to undergo surgery. Previous studies

on clefts in Kumasi have focussed on the epidemiological and social aspects of the condition [3]. There has been no publication on the surgical techniques used and the outcome of surgical management.

The objective of the study was to document the clinical and the epidemiological features of patients presenting with either a cleft lip or palate or both, the surgical techniques used, namely Millard's technique for cleft lip and the Oxford technique for cleft palate, and the outcome of treatment. This knowledge could help in reaching out to parents of affected children and educating them about the possibility of restoring their children back to normal. This knowledge could also be useful for surgical trainees in the technique of cleft surgery, and may also stimulate further research into possible intervention strategies.

## Patients and methods

A five – year retrospective study was undertaken at Komfo Anokye Teaching Hospital (KATH) in Kumasi to document the clinical and epidemiological features, the surgical management and the outcome of treatment of patients presenting with either cleft lip, cleft palate or both, within the period from January 2010 to December 2014. Data on cleft patients were retrieved from the records of the cleft clinic and theatre records and analyzed. Data collected included the name, age, sex, type of cleft, the surgical procedure performed, and the outcome.

Patients with clefts who are referred to Komfo Anokye Teaching Hospital are normally seen at a multi-disciplinary cleft clinic run by a team comprising plastic and maxillofacial surgeons, anaesthetists, paediatricians, orthodontist, speech therapist, nurses and nutritionists [3]. Simple pre-surgical orthopaedics such as elastic traction strapping of a protruding prolabium or closing a palatal defect with an obturator to improve feeding may be done by the orthodontist as early as in the second week. Other problems like malnutrition and infections common especially in cleft palate patients are managed by the nutritionist and paediatricians respectively and the weight gain appropriately monitored. Patients are prepared for cleft lip surgery only when they are three months or older and cleft palate surgery was done after nine months of age [4]. In addition they should have been assessed and found fit for surgery by the anaesthetist of the cleft team. Patients who were assigned to the authors' team for surgery were entered into the current study.

Unilateral cleft lip was repaired using Millard's rotation-advancement technique [5]. This was combined with closed primary nasal repair using the technique of McComb [6]. For bilateral cleft lip the preferred technique was Millard's one-stage repair, where the prolabium was raised off the underlying premaxilla, and superiorly raised forked flaps created from lateral parts of the prolabium, then turned laterally to run under the alar bases. Muscle bundles from the lateral lip elements were sutured to each other across the midline. The vermillion was reconstructed with lateral turn down flaps. The philtrum was created with a prolabial flap using the technique of Mulliken [7]. Closed primary nasal repair was usually done.

Preliminary procedures such as lip adhesions and staged one sided repairs for bilateral cleft lips were not done as patients might not return for the definitive/secondary procedure.

Repair of cleft palate was performed using the single stage two flap palatoplasty with intravelar veloplasty, which is a modification of the technique of Veau, Wardill and Kilner (Oxford palatoplasty) [8]. The patients were discharged to the outpatient department (OPD) after five days. Thereafter they were reviewed weekly for one month; two weekly for two months and three monthly afterwards. Wound healing problems, speech defects and other complications were managed during these reviews.

## Results

Within the period from January 2010 to December 2014, a total of 150 patients were treated for clefts by the authors' team.

They comprised 58 males and 92 females; a male to female ratio of 1: 1.6. The age distribution of the patients is shown in Table 1. Most (74%) of the patients who were operated upon were children aged 12 months or younger. Seven (4.6%) of the patients were adults who were not aware of the possibility of surgical correction of their deformity; they were identified during cleft surgical outreach programmes.

The ages of the patients ranged from 0.25 to 25 years, mean age of one year (12 months), with standard deviation of 14.5months.

The types of deformity treated, the laterality, and the completeness or otherwise of the defects are depicted in Table 2. The commonest (85, N=150) deformity encountered was combined cleft lip and palate. Isolated cleft palate was the least common (23, N=150) deformity but it was associated with much morbidity (malnutrition, middle ear infections and post-operative wound dehiscence). There was a predominance (83%) of unilateral clefts, of which 46% were left-sided and 71% were complete. There were no cases of median clefts.

**Table 1:** Age Distribution of 150 Cleft Patients treated at KATH (2010 – 2014).

Age (months)	Number (Percentage)
0 - 6	76 (51%)
7 - 12	34 (23%)
13 - 18	7 (4.6%)
19 - 24	4 (2.6%)
25 - 30	3 (2%)
31 - 36	4 (2.6%)
37 - 42	4 (2.6%)
43 - 48	3 (2%)
49 - 54	5 (3%)
55 - 60	3 (2%)
>60	7 (4.6%)

**Table 2:** Types of Clefts treated at KATH (2010 – 2014).

Type of Deformity	
Cleft lip	42 (28%)
Cleft lip and palate	85 (57%)
Cleft palate	23 (15%)
Laterality	
Type	Number (Percentage)
Right sided	55 (37%)
Left sided	69 (46%)
bilateral	26 (17%)
Completeness	
Type	Number (Percentage)
Unilateral complete	106 (71%)
Unilateral incomplete	18 (12%)
Bilateral complete	10 (7%)
Bilateral incomplete	8 (5%)
Bilateral mixed	8 (5%)

No perioperative mortality occurred during the study period. Five booked cases had to be cancelled and re-scheduled two weeks later due to difficulty in endotracheal intubation for general anaesthesia. Five patients had partial gaping of the repaired cleft lip at the base of the columella; these were repaired after two weeks. Complete disruption of the repair occurred in four cases of isolated cleft palate; they were managed conservatively for three months before being repaired successfully. No complications were recorded following repair of bilateral cleft lips during the study period.

## Discussion

Developmentally the upper lip and jaw are formed by the penetration of mesoderm between the layers of a pre-existing epithelial membrane which is formed by the invagination of the oral pit. The mesoderm (or mesenchyme) originates from neuroectoderm at the neural crest, and migrates from the back of the head by three routes. The first route is over the top of the developing head and down into the central part of the head – the frontal prominence. The other routes are around the sides of the head into the areas of the developing cheeks. As the mesoderm penetrates between the layers of epithelium it gives rise to the surface swelling of the medial and lateral nasal processes and the maxillary processes. A congenital cleft of the lip, alveolus or anterior palate is due to failure of penetration of mesoderm and the subsequent breakdown of unsupported epithelial membrane [9].

Many techniques of cleft lip repair have been described. Each includes a method of lengthening the shortened lip on the cleft side, which involves detaching the abnormal muscle insertion and reconstructing the lip musculature. Methods described include straight-line techniques (e.g. Rose-Thompson) [10], upper lip z-plasty (e.g. Millard) [5], lower lip z-plasty (e.g. Tennison-Randall) [11,12] and upper and lower lip z-plasty (e.g. Skoog) [13]. The ideal operation for repair of a unilateral cleft lip should result in a symmetrical upper lip and nose [14]. It should be easy to perform, especially by beginners. The Millard's rotation-advancement repair which was used in the current study is simple to plan as it does not involve complicated markings and measurements. Being a 'cut as you go' technique, adjustments can be made up to the very end of the procedure. It allows as much correction of the nasal deformity as possible at the primary operation [5].

In the current study five (4%) of the patients had partial gaping of the wound at the base of the columella an area which has been found to be notorious for complications. In a long term subjective and objective assessment of the scar in unilateral cleft lip repairs using Millard's rotation-advancement technique in 20 patients, Christofides et al. [14], observed that the upper part of the scar just under the nostril sill transgressed the philtral column in all cases; there was peaking in 65%, and notching in 45% of the patients. The Millard's technique could not fulfill all the ideal criteria for a symmetrical upper lip with equal philtral column length on either side. However acceptable aesthetic and functional outcome was achieved in the current study, and all the parents and patients were satisfied with their improved facial appearance (Figure 1).

The bilateral cleft lip is a much more severe deformity because there is absence of muscle in the prolabium, lack of vestige of a Cupid's bow or philtrum and a missing columella. Mulliken's [7], modification of Millard's operation enables a one-stage repair with primary correction of the nasal deformity. The repair of bilateral cleft lip is associated with complications such as partial wound dehiscence, oro-nasal fistula and notching, in some series [15,16]. No such complications were encountered in the current study which involved 26 (17%) patients, making this technique ideal for bilateral cleft lip repair (Figure 2).

Development of the secondary palate begins in the 7<sup>th</sup> week of embryonic life with the development of shelves from the inner aspect of the maxillary processes on each side. The tongue which is developing at this time lies between the two palatal shelves which hang vertically down on either side. As the neck begins to extend during the 8<sup>th</sup> week of embryonic life the tongue moves downwards and the palatal shelves spring upwards to the horizontal position where they grow towards each other. They make contact with each other and with the primary palate anteriorly and the free margins fuse together. Fusion proceeds from front to back; it is not completed until the 11<sup>th</sup> week. Fusion occurs slightly earlier in males than females, explaining the greater frequency of clefts of the secondary palate in the female [17].

A cleft of the palate can occur if for any reason fusion does not occur. This may be due to failure of descent of the tongue, keeping the two palatal shelves apart. It may be due to failure of mesodermal migration into the palatal shelves so that they fail to reach the midline, resulting in a wide cleft with deficient tissue; it may be due to a delay in migration so that the developing face is too wide for closure to occur by the time the mesoderm arrives. Each cause will produce a cleft of different configuration. If the causative factor occurs early it will result in a complete cleft of the secondary palate, if late in



Figure 1: Right complete cleft lip and alveolus, before and after Millard's repair.



Figure 2: Bilateral complete cleft lip, before and after Millard's repair.

an incomplete cleft of the soft palate only or in a submucous cleft [18].

The considerations in cleft palate repair include the timing of the operation, the type of palatoplasty to be performed, and the effect of the repair on speech, facial growth, and Eustachian tube function. The factors that contribute to the outcome of a palatoplasty include cleft dysmorphogenesis, tissue deficiency, types of clefts, specifics of the surgical repair, surgeon's proficiency and multidisciplinary care. The two flap palatoplasty that was used in this study provides a one stage complete closure of the palate nasal lining and anatomic approximation of the levator muscle complex. Total release and dissection of the abnormal muscle attachments to the malformed skeletal base and proper approximation of the free muscle complex provides the basis for a functional palate [18].

In the current study four (17%) of the cases of repaired isolated cleft palate broke down completely and had to be repaired after three months. Wound infection, made worst by underlying malnutrition, was identified to be the cause. A successful secondary repair was possible only after adequate food supplementation by the nutritionist for three months with correction of anaemia by the paediatrician. In all nine complications occurred in the current series, ranging from partial gaping at the base of the columella to complete disruption of palatal repair, giving an overall complication rate of 6%.

A similar study ( Adesina et al.) [15], involving 80 cleft surgeries in 75 patients revealed a high incidence of partial wound breakdown , vermilion notching and hypertrophic scar formation, giving an overall complication rate of 33%. 60% of these complications occurred with unilateral cleft lip repair, 24% with bilateral cleft lip repair, and 16% with cleft palate [15]. Even though the complication rate in the current study is much lower, probably because of the larger sample size, and there were no complications with bilateral cleft lip repair, the major complication of total disruption of a repaired cleft palate did not occur with the latter. It is therefore apparent from this study that successful palatal repair depends not only on meticulous surgical technique to create intact well perfused flaps that are approximated across the cleft with minimal tension but also on pre-surgical preparation including providing adequate nutrition, treating infections and providing adequate pre-surgical orthopaedics where available.

## Conclusion

The commonest cleft deformity encountered was combined cleft lip and palate, most of which occurred in children younger than one year. The Millard's techniques of cleft lip repair, appropriately modified to include closed primary rhinoplasty, provide acceptable aesthetic and functional result. Successful management of cleft palate deformity requires adequate pre-surgical preparation for optimal results.

## Acknowledgements

The authors acknowledge the contributions of Dr Gyikua

Plange-Rhule and Dr Daniel Sabbah, a paediatrician and an orthodontist respectively of Komfo Anokye Teaching Hospital for their roles in the management of these patients.

## References

- Ose M, Anderson B, Mouradian W, et al. (2003) Psychosocial and developmental issues in cleft care: Critical elements of care in: Ose M (Ed) Cleft Lip and Palate, Seattle 19 -20.
- Watson ACH, Edwards M, Watson ACH (Eds) (1980) Advances in the Management of Cleft Palate, Churchill Livingstone, London 134 – 165. [Link: https://goo.gl/OaU9Td](https://goo.gl/OaU9Td)
- Agbenorku P, Sabbah D, Ansah S, Acheampong A, Sabbah D, et al. (2011) Komfo Anokye Teaching Hospital Multidisciplinary Cleft Clinic. J Craniofac Surg 2: 532 – 6. [Link: https://goo.gl/SL6240](https://goo.gl/SL6240)
- Dalston RM (1992) Timing of cleft palate repair: a speech pathologist's viewpoint. Prob Plast Reconstr Surg 2: 30 – 38.
- Millard DR (1964) Rotation - advancement principle in cleft lip closure. Cleft Palate J 1: 246 – 252. [Link: https://goo.gl/M0oZPn](https://goo.gl/M0oZPn)
- McComb H (1990) Primary repair of bilateral cleft lip nose: A 15 year review and a new treatment plan. Plast Reconstr Surg 86: 882. [Link: https://goo.gl/GWdIV1](https://goo.gl/GWdIV1)
- Mulliken JB (2001) Primary repair of bilateral cleft lip and nasal deformity. Plast Reconstr Surg 108: 181. [Link: https://goo.gl/jMS0PO](https://goo.gl/jMS0PO)
- Braithwaite F, Maurice D (1968) The importance of the levator palati muscle in cleft palate closure. Br J Plast Surg 21: 60. [Link: https://goo.gl/p55qyN](https://goo.gl/p55qyN)
- Moore KL, Persaud TVN (1998) The Developing Human. Clinically Oriented Embryology. 6th ed. Philadelphia. W.B. Saunders 237 – 238. [Link: https://goo.gl/8gVusp](https://goo.gl/8gVusp)
- Tennison CW (1952) The repair of the unilateral cleft lip by the stencil method. Plast Reconstr Surg 9:11. [Link: https://goo.gl/k3o1KI](https://goo.gl/k3o1KI)
- Hopper RA, Cutting C, Grayson B, Cleft Lip, Thorne CH (Ed) (2007) Grabb and Smith's Plastic Surgery 6th ed. Lippincott, Williams and Wilkins, Philadelphia 201 – 225.
- Randall P (1959) A triangular flap operation for the primary repair of unilateral clefts of the lip. Plast Reconstr Surg 23: 331 - 347. [Link: https://goo.gl/Fn6WMM](https://goo.gl/Fn6WMM)
- Skoog T (1969) Repair of unilateral cleft lip deformity: maxilla, nose, and lip. Scand J Plast Reconstr Surg 3:109 – 133. [Link: https://goo.gl/DBGkcO](https://goo.gl/DBGkcO)
- Christofides E, Potgieter A, Chait L (2006) A long term subjective and objective assessment of the scar in unilateral cleft lip using the Millard technique without revisional surgery. J Plast Reconstr Aest Surg 59: 380 - 386. [Link: https://goo.gl/ik7lZ6](https://goo.gl/ik7lZ6)
- Adesina AO, Olosoji HO (2011) A study of post-operative complications in primary cleft lip and palate repair in a semi-urban Nigerian Teaching Hospital. Proceedings from: Pan African Association of Cleft Lip and Palate Annual Conference, Kumasi, Ghana p 50.
- Onah I, (2008) Cleft Lip Repair: The experience with subcuticular closure in a Nigerian Teaching Hospital in: Proceedings from 5th Congress: International Cleft Lip and Palate Foundation, Dallas, Forth Worth, Texas 62 -63.
- Patten BM (1971) Embryology of the palate and the maxillofacial region. In: Grabb W.C. Rosenstein S.W. Bzoch K.R. (eds) Cleft lip and palate. Little Brown, Boston p 21.
- Stark RB (1977) Embryology of cleft lip and palate. In: Converse J.M. (ed) Reconstructive plastic surgery. Saunders, Philadelphia p 1941.