



Case Report

Orbital advancement using the modified buttress technique in sub-Saharan Africa: A demonstrative case report

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ABSTRACT

Surgery for craniosynostosis is not new worldwide. However, sub-Saharan Africa, particularly Nigeria, is yet to catch up with the rest of the world. We hereby present a 1 year 6 month old girl with severe left unilateral coronal craniosynostosis operated successfully. Although there are few previous cases of craniosynostosis operated upon in sub-Saharan Africa, to the best of our knowledge, this is the first documented case of Anterior Cranial Remodeling and Orbital Advancement in Nigeria. This single case report demonstrates the ability to improve surgical care through proper training and local multi-disciplinary collaboration.

Keywords: Coronal synostosis, Craniosynostosis, Nigeria, First, Anterior, Cranial, Remodeling and Africa

INTRODUCTION

Single suture craniosynostosis in the context of coronal, sagittal, and lambdoid sutures are commoner compared to the multiple suture craniosynostosis.^[1] The sagittal suture is the most commonly affected, followed by the metopic, the coronal, and the lambdoid suture being the least affected.^[1,2]

Anterior plagiocephaly is characterized by flattening of one side of the forehead.^[1] This is a classical feature of unilateral coronal craniosynostosis. Coronal craniosynostosis can occur as a result of isolated involvement of the frontoparietal suture or in combination with the frontosphenoid, frontoethmoid, and spenoethmoidal suture(s).^[1,3] The coronal suture is formed by the frontal and parietal bones. Isolated frontosphenoid craniosynostosis can occur without involvement of the frontoparietal (coronal suture) and this is a known cause of anterior plagiocephaly, even though there are few cases reported in the literature.^[1,3]

The main indication for surgery in single suture craniosynostosis is to improve the cosmetic appearance of the individual.^[4,5] Other reasons for intervention are raised intracranial pressure and eye problems (hypertelorism and amblyopia), which can be corrected if surgery is done relatively early.^[5]

It is striking that despite the high incidence of craniosynostosis in other parts of the world, there appear to be few cases and very little or no interventions reported in most parts of sub-Saharan

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Africa (with the exception of South Africa). It is surprising that Nigeria which is the most populous black country with a population of about 180 million has produced very little data on this disease entity and its the treatment. There are few African reports of surgical correction of congenital malformation of the central nervous system in which craniosynostosis is documented. One study on craniectomy for craniosynostosis by Odeku *et al.* and a single study on suturectomies for the treatment of craniosynostosis by Ibe are the only studies in Nigeria elucidating the management of craniosynostosis.^[6-9] To the best of our knowledge, this is the first published case of anterior cranial remodeling and orbital advancement in Nigeria.

CASE REPORT

The patient is a 1-year 6-month-old girl who presented to our institution with severe flattening of the left fore head which was present since birth [Figure 1]. The mother became concerned about the cosmetic outlook of the child and decided to seek medical intervention. On examination, she was neurologically intact with no visual deficit, but she also had pectus carinatum. She had a brain CT scan done that showed normal brain with an obviously fused left coronal



Figure 1: (a and b) Pre-operative images of a patient with left unilateral coronal craniosynostosis.

suture. She was referred to the pediatricians on account of the pectus carinatum and for further review. She was evaluated and when she was fit, had an anterior cranial remodeling with unilateral orbital advancement [Figure 2]. She was transfused with one unit of blood that was commenced at the onset of surgery and she had a good postoperative recovery. Postoperatively, she had a fairly good cosmetic appearance of the head [Figures 3 and 4].

Surgical technique

Patient was placed in supine position with head ring (because of the absence of a pediatric horseshoe head support). Patient was shaved on-table. Routine cleaning and draping of the operation site were done. Marking on the head was made for the scalp incision. The scalp was injected with copious volumes of adrenaline in saline (1:200,000) to aid hemostasis and hydrodissection. A Zig-Zag bicoronal skin incision was made and developed to the galea, scalp flap was raised and Raney clips applied. Skin flap was mobilized forward as far as the supraorbital ridge. The orbital contents were dissected downwards by separation the orbital periosteum from the roof, medial, and lateral orbital walls. The temporalis muscles were reflected downward after detaching them from the superior temporal lines and the frontal periosteum reflected forward. A bifrontal craniotomy was done leaving the orbital bandeau. The orbital bandeau was separated in the left pterional region (affected side), roof of the left and right orbit. The height of the orbital bandeau was about a finger breath. The right pterional region was left. The bandeau was straightened and a left unilateral orbital advancement of the orbital bandeau was done. A piece of bone was used to stabilize the gap in the left temporal region that was anchored using PDS 2-0 sutures. Eight holes were made four on the connecting bone strut used, two on the orbital bandeau, and two on the posterior aspect of the temporal bone, and the construct was held in place using four sutures. The frontal bone flap was remodeled to form the new forehead that was anchored

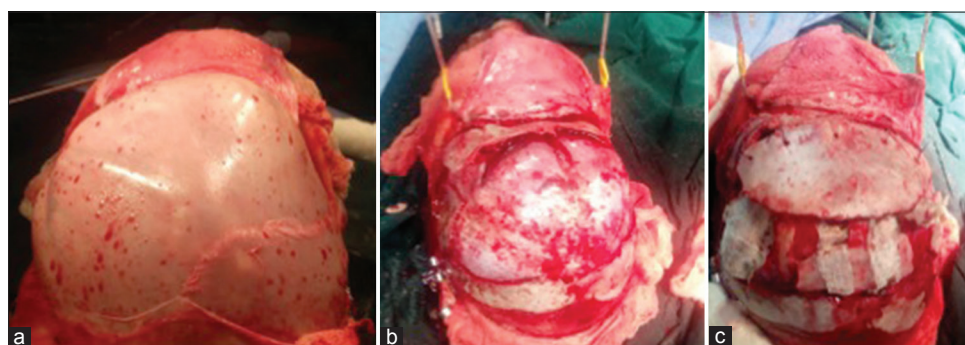


Figure 2: Intraoperative images showing the fused left coronal suture and the obvious left anterior plagiocephaly (a). Images of the new forehead being formed and the new construct showing the advanced orbital bandeau on the left the bony stabilizing construct (b and c).



Figure 3: (a-c) The post-operative images (a few days after surgery).



Figure 4: The post-operative (1 year 3 months after surgery).

to the orbital bandeau after drilling four holes on the lower aspect of the new forehead and another four in the upper aspect of the orbital bandeau using four PDS 2–0 sutures. The pieces of bone from the lower part of the frontal bone (orbital bandeau) were placed behind the new forehead. The temporal muscle were put in place and anchored to each other with vicryl 2–0 sutures. Pericranium was put in place. The scalp was closed in two layers. Patient was transfused from the commencement of surgery and one unit of adult sedimented red cells was used (because we do not have facility for making packed cells and pediatric blood bags are not available). A gamgee dressing was applied and held in place with a creep bandage

DISCUSSION

The reported incidence of craniosynostosis in sub-Saharan Africa appears to be relatively low. A few reasons may explain this phenomenon. First, we may not be actively sensitized and looking out for this pathology. Second, in some cultures when a child has some deformity of the head at birth the granny when bathing the child tries to correct the deformity. Third, the cosmetic value is not given much attention in view of competing needs and the deformity being considered a normal variant. The fourth reason may be due to our inability to offer the patient deserving intervention the necessary care.

Indication for surgery in craniosynostosis

As stated earlier, the indications for surgery include cosmetics, raised intracranial pressure, and the early feature of amblyopia.^[5]

In our index patient, the mother was concerned about the esthetic appearance of her daughter in view of the marked progressive deformation and the patient being a girl and possible effect when she may be interested in getting married.

In our unit, within the span of 3 years, we have seen about three patients with classical craniosynostosis; the index patient, the second had a sagittal craniosynostosis, the third had Crouzon anomaly, but not quite certain if he had craniosynostosis.

Types of surgery for craniosynostosis

The surgery of coronal craniosynostosis can be open or closed (endoscopic). The open technique had been in used for some time, while the endoscopic is relatively newer. The best time for the open approach is around the 7th month of age while the endoscopic method is favored in patients of age, 2–3 months old. For our index patient only, the open method would be recommended in view of her age (1 year and 6 months). The endoscopic technique has a smaller scar, less blood loss, and need for transfusion. However, the patients will need to wear helmets for some time to help in the correction.

Intraoperative hemostasis with blood and fluid management

GMB believe in the principle of his mentors (SC), where blood transfusion is commenced at the beginning of surgery. This is based on the fact that the blood volume of children is relatively small and they can easily decompensate with respect to their cardiovascular status. While my (GMB) mentors would usually take out the orbital bandeau completely, we chose the modified buttress technique with unilateral advancement because we did not have absorbable plate and

screws as well as gelfoam that would assist to maintain the construct.^[10] It is important to know that absorbable plates are not mandatory. Therefore, the use of bone and sutures is a cheap and viable option. SC used this technique for over a decade before absorbable plates became available.

Our post-operative outcome

From the post-operative images of the patient, we have a fairly acceptable cosmetic outcome.

Management of craniosynostosis in Nigeria

Not much has been documented in the management of craniosynostosis in sub-Saharan Africa, and particularly Nigeria. To the best of our knowledge, only two articles discussed or mentioned the operative management of craniosynostosis. Odeku *et al.* 2007 had described that as far back as the inception of neurosurgery in 1962 within the 1st year he had done two craniectomies for children with craniosynostosis, the second paper mentioned the use of suturectomies in the management of craniosynostosis in Nigeria.^[11] Hence, the index case is likely the first case of anterior cranial remodeling and orbital advancement in the management of unilateral coronal craniosynostosis in Nigeria to be published in the literature.

Multidisciplinary management of the index patients

This patient also has a pectus carinatus of which we were not sure if it was related to a syndrome or from rickets. She had a pediatric review to rule out the possibility of a cardiac anomaly.

The role of the anesthesiologists is very crucial in the surgical management of these conditions. The blood loss should be closely monitored and adequate volume transfused. They should also watch out for sign of intraoperative air embolism. It is also important to note that in sub-Saharan Africa there is limited access to pediatric neurosurgical care due to insufficient and capable personnel as well as facilities.^[12] These patients who are poor and vulnerable in most cases have to pay for health-care out of their pockets.

Challenges and opportunities in the management of craniosynostosis and other pediatric neurosurgery conditions in sub-Saharan Africa

The practice of modern neurosurgery in sub-Saharan Africa and Nigeria has been on for a while.

Skilled manpower and well trained support staff

Sub-Saharan Africa is gifted with some of the best and brightest minds. This also applies to neurosurgery.

Unfortunately, while some specialist may not have optimal exposure because of the limited spectrum of some of our practice, other who have had the requisite international exposure come back to mother Africa with limited and sometime absence of equipment and support staff. Hence, the skill acquired begins to spiral down until it is almost lost. This has been one of the major banes of the sub-Saharan physician and surgeon. Limited support staff is a major problem. In our setting, for example, we do not have a dedicated pediatric ICU for the index patient with craniosynostosis. We also do not have a single trained pediatric intensivist. Hence, there is a need to train a neurosurgical team from the surgeon to the anesthesiologist, nurses (perioperative and intensive care).

Equipment (neurosurgical, imaging, and radiotherapy)

Neurosurgery needs equipment for surgery, imaging, and sometimes therapy. In the index case, we did not have the set for cranial reconstruction; we made use of our regular craniotomy set.

In modern neurosurgery, CT scan and MRI are considered basic investigations. In many institutions including ours, we work for several months without these imaging modalities, most times because they are faulty and there is limited resource to put them in functional state. This expensive equipment could be affected by the poor and unsteady power supply with limited uninterrupted power supply (UPS) machines. We also have a poor maintenance culture and there are very few well trained biomedical engineers with the requisite knowledge and experience.

Radiotherapy machine is limited and most times faulty.

Critical care

Low resource countries especially in sub-Saharan have a great challenge in neurosurgical critical care. Most centers in Nigeria do not have dedicated intensive care units for children. Even the general intensive care units have limited functional ventilators. Sometimes patients are ventilated without arterial blood gas monitoring because the machine is not available.

Research and innovation

There are many brilliant innovative people in sub-Saharan Africa and poor resource countries that can be involved in research and development of tools that can be used in neurosurgery. There has also being poor interaction between physician and engineers in our setting that if it is well harnessed many innovations can be made with limited expense from the African sub-continent.

Strategies to overcome challenges and opportunities

Training

Training of a team of neurosurgeons with support staff (pediatric anaesthesiologist, pediatric intensivist, perioperative nurses, radiologist, and neurologist) will greatly enhance the pre-, intra-, and post-operative care of patients. Fellowships such as those done by the WFNS, ISPN, and AANS are very helpful in manpower development. Such collaborations can help local teams discuss complex cases with more experienced team and also provide mentorship.

Development of functional systems

One of our observations is that resource poor countries have poor functional institutional systems. These could be learnt from centers that have worked efficiently for centuries. Data storage and retrieval are a great challenge that limits resource poor setting from being able to publish paper with a long follow-up period. Many patients are also lost to follow-up. The use of protocols makes the treatment of patients easy and more unified. These are lacking in most resource poor countries. ICU protocols can help ease the care of neurosurgical patient.

Research and institutional collaboration

Sub-Saharan Africa has great potentials for research particularly in congenital malformations of the central nervous system and trauma. Institutional collaboration can help improve the quality of research work being published and the ability to place them in more visible Journals, hence increase the citation and the world learning from such environments. Institutional collaboration can improve surgical care, critical care, neuro-oncological care, and research. This can also provide facility for exchange programs and learning.

Cheap labor and medical tourism

Sub-Saharan Africa if well explored can be a site for medical tourism, in view of the cheap labor, cheap land, and reasonable taxes. State of the art hospital can be built to cater for the rich locals and foreigners who may be willing to have affordable care, beautiful natural scenic terrain and tourism while receiving high quality medical care.

CONCLUSION

Despite the fact that a number of complex neurosurgical procedures are done in sub-Saharan Africa, little is documented on craniosynostosis and anterior cranial remodeling particularly in Nigeria. Hence, this article is

to stimulate neurosurgeons and the public to know that it can be done despite our limited resource.^[12] The need for multi-disciplinary collaboration, training, and adaptable surgical techniques such as the modified buttress technique is necessary in developing this part of neurosurgery.^[12] Therefore, routine craniosynostosis surgery is feasible in sub-Saharan Africa.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Bot G, Leshem D, Shiran SI, Ben-Shachar S, Constantini S, Roth J. Frontosphenoid synostosis: An unusual cause of anterior plagiocephaly. *J Craniofac Surg* 2015;26:174-5.
2. Persing JA. MOC-PS(SM) CME article: Management considerations in the treatment of craniosynostosis. *Plast Reconstr Surg* 2008;121:1-11.
3. Francel PC, Park TS, Marsh JL, Kaufman BA. Frontal plagiocephaly secondary to synostosis of the frontosphenoidal suture. Case report. *J Neurosurg* 1995;83:733-6.
4. Hankinson TC, Fontana EJ, Anderson RC, Feldstein NA. Surgical treatment of single-suture craniosynostosis: An argument for quantitative methods to evaluate cosmetic outcomes. *J Neurosurg Pediatr* 2010;6:193-7.
5. Matthews D. Craniofacial surgery-indications, assessment and complications. *Br J Plast Surg* 1979;32:96-105.
6. Binitie OP. Congenital malformations of the central nervous system at the Jos University Teaching Hospital, Jos Plateau State of Nigeria. *West Afr J Med* 1992;11:7-12.
7. Komolafe EO, Komolafe MA, Adeolu AA. Factors implicated for late presentations of gross congenital anomaly of the nervous system in a developing nation. *Br J Neurosurg* 2008;22:764-8.
8. Adeleye AO, Olowookere KG. Central nervous system congenital anomalies: A prospective neurosurgical observational study from Nigeria. *Congenit Anom (Kyoto)* 2009;49:258-61.

9. Ibe MO. Craniosynostosis: An assessment of the results of suturectomies. *Port Harcourt Med J* 2010;5:240-5.
10. Seal SK, Steinbok P, Courtemanche DJ. The cranial orbital buttress technique for nonsyndromic unicoronal and metopic craniosynostosis. *Neurosurg Focus* 2015;38:E4.
11. Odeku EL. Beginings of neurosurgery at the University of Ibadan, Nigeria. *Ann Ib Postgrad Med* 2007;5:34-43.
12. Constantini S. Disparity in pediatric neurosurgery provision of care: An illustration. *Childs Nerv Syst* 2019;36:451-3.

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