

# Modification of Huntington's Procedure In The Tibialization of the Fibular in Awka, Anambra State Nigeria-A Report of Cases of Infected Non Union and Acute Trauma with Tibia Loss

Nwachukwu AC, Nwachukwu CC, Melekwe CK

**Abstract**— Tibialization of the fibularis a procedure that requires medialization of the fibular in whole or in part to replace the function of the tibia. This could be as a result of large tibia defect due to trauma, infection or congenital loss. We report two cases of tibialization of the fibular by modifying the Huntington's procedure. Only one stage of the procedure was used to tibialize one end of the fibular in each case and then the outcome observed.

Patient A is a 32year old man who had infected fragments of remaining right tibia following gunshot injury a year prior to presentation. He underwent excision of sinus riddled skin and scars and excision of the infected segment, and tibialization of the proximal end of the fibular to the distal end of the proximal tibia prepared for it while still maintaining its natural articulation on the distal tibiofibular joint. He also had flap cover and skin grafting. Tibialization and fibular hypertrophy was noted over 1year to 4year period.

Patient B is a 50year old woman who was a victim of motorcycle crash. She sustained Gustillo and Anderson type 3B open distal left tibia fracture with muscle and skin loss. She was resuscitated and underwent an emergency tibialization of the fibular, had muscle advancement flap cover and skin grafting. Follow up for 3years showed fibular hypertrophy and painless ambulation.

**Conclusion:** Modification of Huntington's procedure is effective in the treatment of tibial bone gap.

**Index Terms**— Modification of Huntington's procedure, Tibialization of fibular.

## I. INTRODUCTION

Tibialization of the fibularis a procedure that requires medialization of the fibular in whole or in part to replace the function of the tibia. This could be as a result of large tibia defect due to trauma, infection or congenital loss. Huntington described this procedure in 1905 and it has two stages. The typical huntington's procedure has Stage one which involves the tibialization of one end of the ipsilateral fibular (usually the proximal end) while Stage 2 involves the tibialization of the distal end of the fibular. The procedure has become a veritable option in the management of tibia bone gap in

resource poor regions. Many centres do not have the expertise for bone lengthening. Even in centres where the expertise is available, many patients do not afford the cost of bone lengthening procedure. The bone lengthening procedure requires patient cooperation and long period of time in order to achieve a good result. Tibialization, therefore, becomes an important option in the management of these patients.

We report two cases of tibialization of the fibular by modifying the huntington's procedure. Only one stage of the procedure was used to tibialize one end of the fibular and then the outcome observed.

## II. METHODOLOGY AND RESULT

Patient A is a 32year old man who was a victim of gunshot injury from a local low velocity gun at a close range, a year prior to presentation. He sustained severely comminuted left tibia fracture, sparing the fibular- A Gustillo and Anderson type 3B tibia injury. He was managed by a surgeon with debrimor, external fixation and application of scotch cast. He was on this cast for one year. He also had multiple discharging sinuses from the antero-medial aspect of the right leg. Examination revealed a right leg with varus deformity, contracted skin with discharging sinuses. Xray showed a multiple, mottled and comminuted fragments with extensive tibia gap. Chronic osteomyelitis of the tibia with gap union was noted. He underwent excision of sinus riddled skin and scars and excision of the infected segment. The excised portion measured 12 centimeters in length. There was tibialization of the proximal end of the ipsilateral fibular to the distal end of the proximal tibia prepared for it while still maintaining its natural articulation on the distal tibiofibular joint and ensuring maintenance of limb length equality by pulling the limb to length. Several screws were used to achieve stability of the fibular placed in the medullary cavity of the proximal tibia. Muscle advancement flap was raised to cover the exposed tibia and fibular construct. He was continued on parenteral antibiotics for 6weeks. He had skin grafting a weeks later. He was mobilized on bilateral axillary crutched non- weight bearing. He commenced very protected partial weight bearing 16weeks post surgery and progressively increased weight bearing until was one year post operatively before being asked to commence full weight bearing. Each decision was taken at every visit with radiological evidence. Full tibialization was noted within one year and fibular hypertrophy progressively noted over 4year

Dr Nwachukwu A.C, Department of Surgery, Chukwuemeka Odumegwu Ojukwu University(COOU)/COOUTH, Awka. Anambra State Nigeria

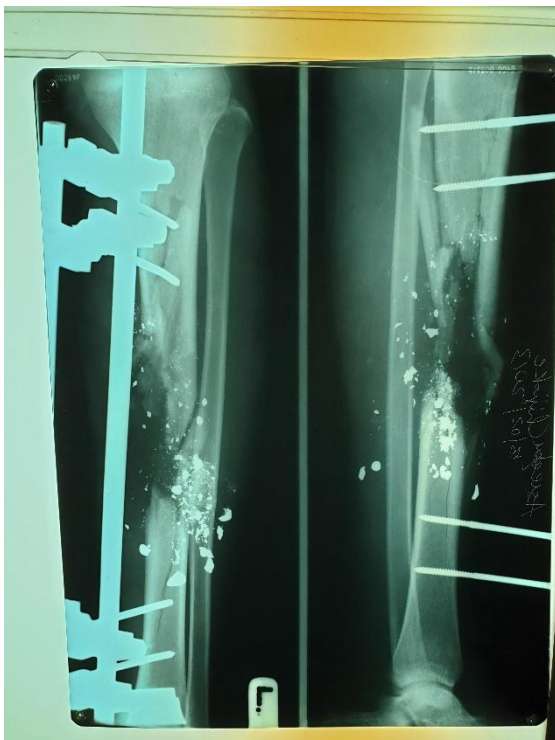
Dr Nwachukwu CC, Department of Community medicine Chukwuemeka Odumegwu Ojukwu University, COOU/COOUTH, Awka Anambra State, Nigeria

Dr Melekwe CK, Department of Surgery, Igbiniedion University Okada Edo State, Nigeria.

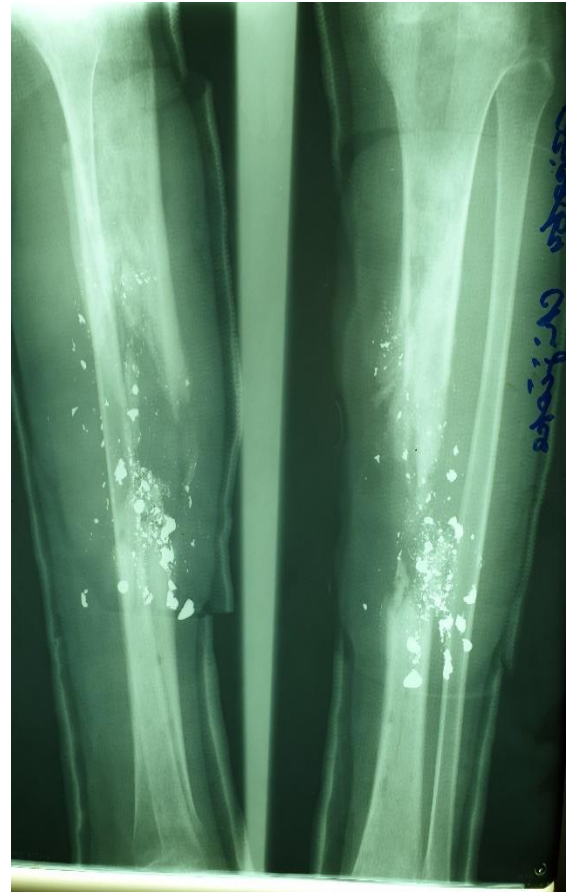
period. However, we noted a discharging sinus near the scar of the area where incision was made at the proximal tibia. This was handled by wound swab microscopy, culture and sensitivity, removal of all the screws, debridement and sequestrectomy of any dead bone. Absorbable, gentamycin impregnated bone beads were inserted into any defect created by debridement and sequestrectomy. Parenteral antibiotics was continued as informed by culture result. Patient's discharge stopped and he continued oral antibiotics for another 6 weeks.

Patient B is a 50 year old woman who was a victim of motorcycle crash. She sustained extensive injury at distal third of the left leg with tissue and distal tibia loss. It was a Gustilo and Anderson's type 3B injury. X-ray showed severely crushed distal end of the tibia sparing only the comminuted articular end of the tibia which articulates with the talus. She was resuscitated following the accident. She had debridement of the distal leg and subsequently underwent excision of the crushed bones leaving a bone gap of 8 centimeters. An emergency primary tibialization of the ipsilateral fibular was done. The distal end of the harvested fibular was passed in to the comminuted proximal end of the distal tibia stump articulating with ankle joint. The soft tissue loss was covered with a careful muscle advancement flap. She had skin grafting over the muscles. The construct was stabilized using external fixators which were passed into the proximal tibia and the navicular bone, into the navicular due to the fact that the severely comminuted distal end of the tibia could not hold a screw. She was on parenteral antibiotics for 4 weeks due to the nature and contamination of her wound. Protected weight bearing was commenced at 16 weeks. She commenced full weight bearing at 8 months. She has been on follow up for 3 years and fibular hypertrophy has been noted. She ambulates without pain since then.

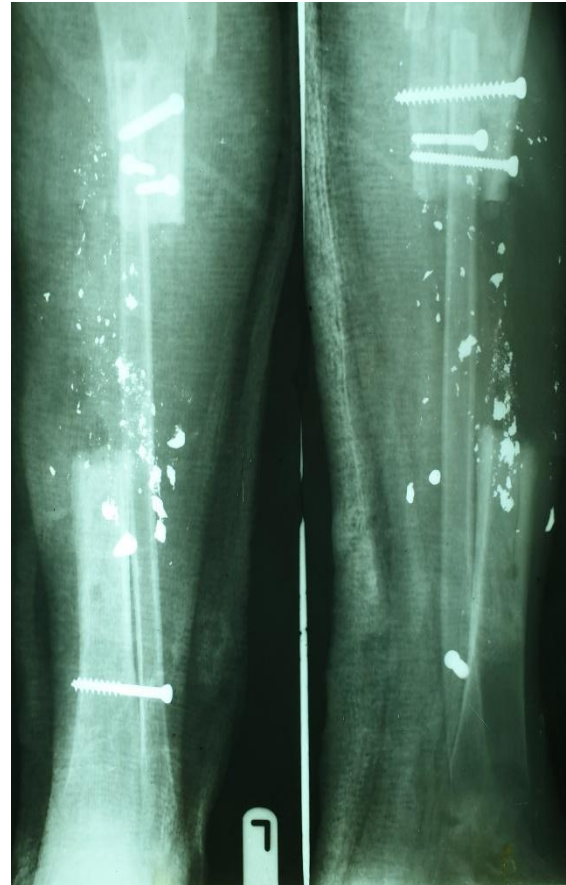
#### PATIENT A



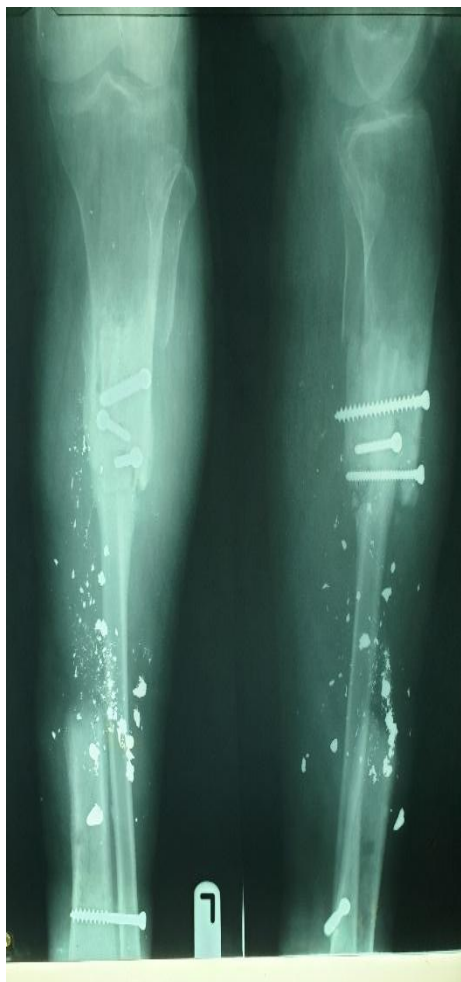
Radiograph 1: Treatment with external fixator.



Radiograph 2: Placed in cast. Osteomyelitis noted.



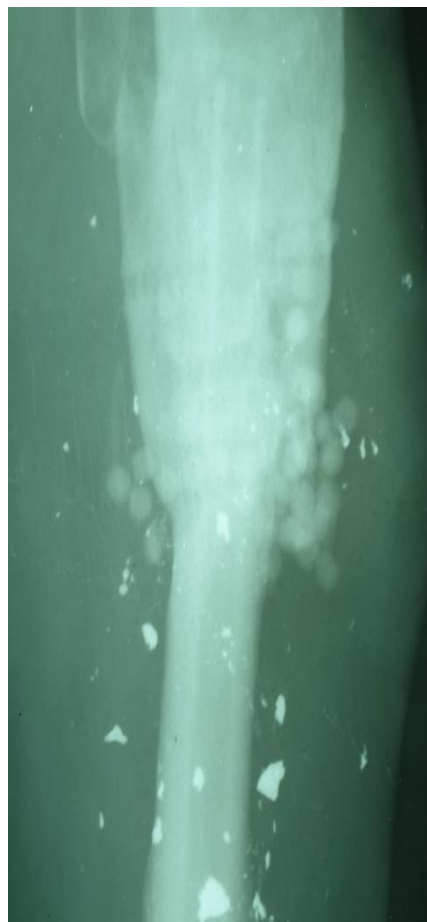
Radiograph 3: Immediate post op Xray.



Radiograph 4: Early signs of callus formation



Radiograph 5: Hypertrophy of fibular noted.



Radiograph 6: Screws removed and absorbable Antibiotic bone beads inserted.



Radiograph 7: The fibular Hypertrophy in lateral view





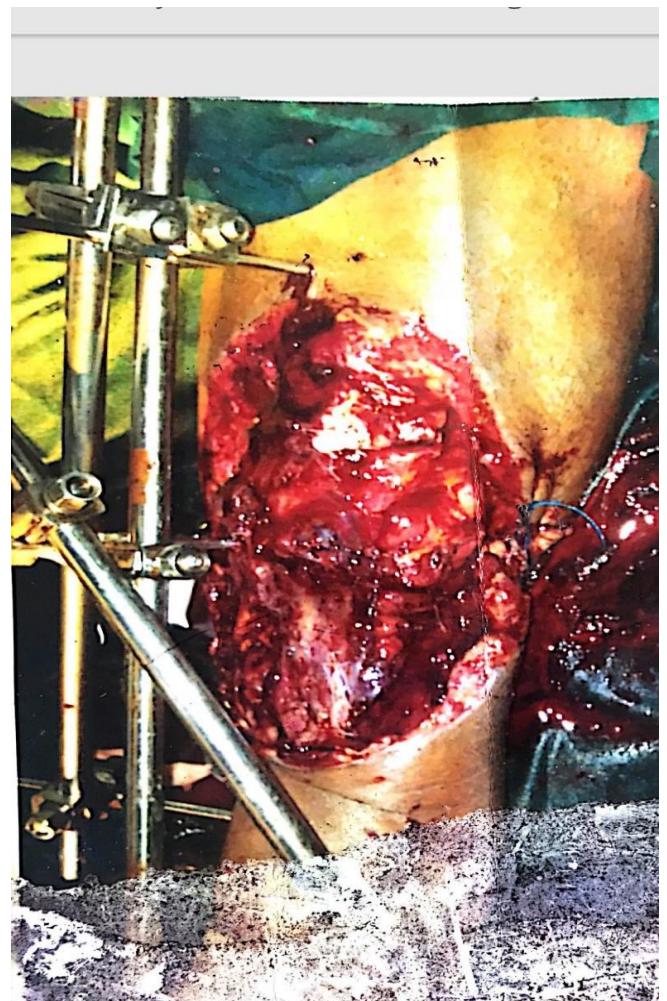
Radiograph 8: AP View.  
PATIENT B



Picture 2: Mangled Leg Showing level of tibia comminution.



Picture 1



Picture 3 : Post op pix showing external fixator in-situ





Picture 4



Picture 6



Picture 5



Radiograph 9



Radiograph 10: Fibular hypertrophy noted.



Radiograph 11

### III. DISCUSSION

Huntington procedure has gained acceptance in resource poor regions. Most procedures that have been done have been largely stage 1 and stage 2 procedures either done in one theatre session or two different times[3]-[9]. When the 2 stages are done in one surgery, it is due to the fact that the tissues are soft and supple and mobilization of the fibular is easier and extensive dissections that affect the blood vessels are not done[9]. When the 2 stages are done in two different surgeries, it is due to the fact that the surgeon wants to ensure that the dissections of the first surgery is allowed to revascularized before attempting the second surgery. This is to ensure that the vasculatures of the fibular are not compromised.

The risk of vascular compromise occurs more in old gap unions with fibrotic tissues following long period of healing. This makes preservation of fibular vessels difficult and can lead to ischemia of the fibular and subsequent necrosis. Therefore they are usually done in two stages[9]-[11].

Many of the tibia defects which require either bone lengthening or tibialization are usually more than 5

centimeters and therefore, cannot be treated by either iliac bone grafting or ordinary bone strut augmentations. Therefore, the need for either bone lengthening or tibialization of the fibular[3].

Bone lengthening procedures are expensive, tedious and time consuming. It requires expertise, a willing and motivated patient who also keeps to instructions. The expertise is not readily available and when available, many patients cannot afford their implants and cost of procedure especially in regions where health insurance is still a mirage.

This, therefore, makes tibialization of the fibular very attractive. This tibialization is only possible when the ipsilateral fibular is spared from whatever issue led to the tibia loss. This is due to the fact the use of contralateral fibular will require microvascular surgery to attach the fibular to the contralateral vessels and therefore may not be handy.

What is different in these two reported cases is that the conventional huntington's procedure[1,2&3]. was modified to achieve the result of tibia bone gap treatment. This has yet be reported in any of the literatures so searched. Whereas there has been several emergency tibializations following trauma and tibialization of the fibular following excision of infected segments using both the proximal and distal ends of the fibular, our reported two cases retained their natural articulation on one end of the fibular with very good outcome[Radiographs 8&9].

Patient A had excision of the infected middle segment of the left tibia following gunshot injury that occurred one year prior to presentation[Radiograph 2]. He had debrimor, external fixation and later, application scotch cast prior to presentation[Radiographs 1&2]. The middle comminuted and gapped segment was infected with chronic osteomyelitis. The affected area was about 12centimeters in length and therefore too long for just bone grafting and he had tethered skin which was over the infected and discharging bone fragments. The soft tissues were contracted and fibrotic which would have made it difficult for any attempt at bone lengthening. The fibular was thankfully spared and therefore became readily available.

Due to the infection and unhealthy skin around the area, we undertook extensive debrimor, sequestrectomy and copious irrigation[7]-[8]. To reduce the risk of infection spread and devascularization of the fibular, we undertook to tibialize the proximal fibular into the proximal tibia fragment leaving the natural articulation of the distal fibular intact. This is to preserve the vasculature of the middle to distal fibular ensure the fibular is well supplied. He was observed over a period of 2 years.

Satisfactory healing of the tibialization and hypertrophy of the fibular was noted. However, there was a discharge at the proximal leg close to the scar. This was handled by removal of screws and minor sequestrectomy and insertion of absorbable gentamycin bone beads[Radiographs 6,7&8]. Presently, patient leads a normal without a recurrence of his discharge and with full weight bearing[Picture 1].

Patient B who had extensive Gustillo and Anderson 3B injury to the left tibia[Picture 2]. Her defect was 8cm at the distal third of the tibia after debrimor in theatre. She was an indigent patient whose financial status could not afford any



form of expensive procedure. She was offered emergency tibialization of the fibular[1]-[2].She also had comminuted articular end of the tibia.

She had emergency tibialization of the ipsilateral fibular[1][Radiograph 9],

This particular patient's distal fibular was harvested and medialized into the comminuted distal tibia and the whole construct held with an external fixator[Picture 3]. Due to extent of comminution there was no schanz screw in the distal tibia, it was passed in to the navicular bone to maintain stability.The proximal articulation of the fibular with the proximal tibia was not disturbed reducing the possibility of devascularizing already badly injured leg.

This turned out well since the distal fibular healed solidly with the comminuted distal tibia. Hypertrophy of the fibular has been progressive[2][Radiographs9,10&11].Her preoperative and immediate post operative xrays were destroyed by water and a few pictures were only salvaged to show the nature of injury,

Excitedly,patient ambulates well without any form of pain after being followed up for3years[Pictures 2,3,4,5,6].

The mild varus tilt of the legs did not bother the patients in the face of good function of their limbs[10]

#### IV. CONCLUSION

These two patients have demonstrated that modification of Huntington's procedure is very effective in the treatment of tibia bone gap either caused by infection or injury. The resultant mild varus deformity is negligible. The procedure is faster and reduces morbidity associated with prolonged operations.

#### REFERENCES

- [1] Fatih Parmaksızoğlu, Eren Cansü,Mehmet Bekir Ünal, and A. Yener Ince, Acute emergency tibialization of the fibula: reconstruction of a massive tibial defect in a type IIIC open fracture,Strategies Trauma Limb Reconstr. 2013 Aug; 8(2): 127–131.
- [2] Gupta SP<sup>1</sup>, Garg G The Huntington procedure: still a reasonable option for large tibial defects in paediatric patients.Journal of Children's Orthopaedics[29 Oct 2014, 8(5):413-421]
- [3] Gayito RC, Priuli G, Traore SY, Barbier O, Docquier PL Treatment of large diaphyseal bone defect of the tibia by the "fibula pro tibia" technique: application in developing countries.Acta Orthopaedica Belgica[01 Mar 2015, 81(1):17-22]Kundu ZS,
- [4] Gupta V, Sangwan SS, Kamboj P Gap nonunion of tibia treated by Huntington's procedure.Indian Journal of Orthopaedics[01 Nov 2012, 46(6):653-658]
- [5] Khiami F, Rampal V, Seringe R, Wicart P Congenital pseudarthrosis of the tibia: an atypical proximal location.Orthopaedics & Traumatology, Surgery &Research : OTSR[01 Feb 2010, 96(1):70-74]
- [6] Zamora-Muñoz PM<sup>1</sup> Orellana-Reta C ,Treatment of the tibial bone defects by traumatic sequels with the Ilizarov method in children,Acta Ortopedica Mexicana[01 Nov 2007, 21(6):318-322]
- [7] O. C. Nwokike1\*, E. E. Esezobor2, D. O. Olomu1, E. O. Edomwonyi1, J. E. Onuminya1,Tibialization of Fibula in Treatment of Major Bone Gap Defect of the Tibia: A Case Report ,Open Journal of Orthopedics, 2015, 5, 240-244
- [8] A Fazal, JC Mwangi ,Tibialization of the fibula in a child with chronic osteomyelitis of the tibia, East African Orthopaedic Journal . Vol 7 No.1(2013).
- [9] Surendra Mohantuli,Anil Aggarwal, Arum Pal Signh, Tibialization of fibular for mangled leg, Neglected Musculoskeletal injuries ,Chapter 20, Pgs 287-289
- [10] Alireza Rahimnia,<sup>1,\*</sup>Frank Fitoussi,<sup>2</sup>George Penneçot,<sup>2</sup> and Keywan Mazda<sup>2</sup>Treatment of Segmental Loss of the Tibia by Tibialisation of the Fibula: A Review of the Literature,Trauma Mon. 2012 Winter; 16(4): 154–159.

- [11] Tuli, Tibialization of the Fibula: A Viable Option to Salvage Limbs with Extensive Scarring and Gap Nonunions of the Tibia.Clinical Orthopaedics and Related Research (1976-2007): February 2005 - Volume 431 - Issue - pp 80-84.