Traditional Bone Setters' Gangrene: An Avoidable Catastrophe, 8 Years Retrospective Review in a Private Orthopedic and Trauma Center in South-East Nigeria

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Abstract

Background: Traditional bone setters apply tight splints on the limbs of patients in their practice settings. Most of the times, these tight splints will result in compartment syndrome and when they are not recognized on time, they will deteriorate into gangrene. **Design:** This is a retrospective study covering a period between October 2007 and September 2015 in a private orthopaedic and trauma centre in the south-east of Nigeria. **Results:** A total of ten patients out of sixty seven patients had amputations on account of traditional bone setters' gangrene constituting 14.9%. All of the patients with bone setters' gangrene had two stage amputations. One of the patients refused amputation and he was referred to another centre. There was zero mortality. **Conclusion:** Traditional bone setters' gangrene is an avoidable orthopaedic disaster that is common in our environment. Genuine efforts should be made by all the stakeholders to reduce and possibly to eliminate this catastrophe.

Key words: Amputation, bone setters, compartment syndrome, gangrene, tight splints

Introduction

Traditional bone setters abound in our clime. They are unorthodox health practitioners who treat fractures in a traditional way and who believe that their abilities to perform the art are inherited from their forefathers. Their services which are shrouded in mystery are well-preserved as a family practice, and apprenticeship and training are transmitted via oral tradition.[1,2] This art is mainly the application of combined herbal and earthen concoctions on the limb followed by improper immobilization with a wooden or bamboo splint without recourse to anatomy, physiology, or radiology. Usually, the splint is tight and this results in compartment syndrome that often deteriorates into gangrene or limb death.[3] The only treatment for gangrene is amputation and this is devastating to the patient and the family members even when it is the only life-saving option. Many people believe that fractures cannot be managed properly by the orthodox medical practitioner and these include some educated patients. The traditional bone setters enjoy a high level of patronage and family and friends' influences, easy access, perceived cheapness, and fear of amputation by the orthodox practitioners are some of the reasons patients consult bone setters.[4] It is estimated that 70–85% of patients with fractures first visit the traditional bone setters before some may elect to go to the orthodox practitioner, only when complications occur or when they are not satisfied with their treatments.[1,5,6] This catastrophe can be curbed to a large extent by changing the mindset of the patients and educating the bone setters.

The literature is awash with reports of limb gangrene and other treatment complications caused by traditional bone setters and the reasons for their patronage and their methodologies.[4,7] Bone setters' gangrene constitutes a great challenge for the orthopedic surgeon who has to grapple with the optimization of the toxemic patient and a life-saving amputation added to the psychology of being called an amputation specialist in a derogatory way. It is pertinent to note that one of the reasons cited by patients for patronizing the bone setters is the fear of amputation by the orthodox practitioners.[4,7-9] It is

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equally pertinent to note that the bone setters cannot perform amputation and so after causing unintentional gangrene, they would send the patient out to the orthodox medical practitioner who would offer amputation as the only solution at that late stage of presentation. This is probably the reason why many people ignorantly believe that once patients are taken to the orthodox medical practitioners that the latter is quick to resort to amputation without giving the fractured limb a chance. Thus, the negative campaign thrives and the practice with impunity continues.[1]

The traditional bone setting is cultural, and like many similar traditions, it would be near impossible to eradicate it and despite health education, high patronage, and mismanagement are still frequently encountered. While the contemporary orthopedic practice has just existed for a couple of decades in our environment, traditional bone setting has outlasted many millennia.[10] Incorporating traditional bone setters into the primary health care as well as instituting a training algorithm have been suggested by some authors,[11,12] but it will need complementary efforts by the contemporary orthopedists and the traditional bone setters to make it successful.[13] There are older reports of bone setters' gangrene contributing to a sizable number of major limb amputation in our subregion.[2,9,14] The objectives of this study are to determine the prevalence of bone setters' gangrene in our practice, the age and sex distribution of the patients and to highlight the influence of traditional bone setting on our choice of treatment.

Patients and Methods

This is a retrospective study carried out in a private orthopedic and trauma center located in the commercial city of Onitsha, in the southeast region of Nigeria. The center is a 25-bedded hospital with a very high bed occupancy, and it specializes in orthopedic and trauma care. Clientele is mainly from the densely populated commercial city and its immediate environs and from many traditional bone setters' homes, scattered within the vicinity.

All of the patients that were treated in the center had their gangrenous limbs amputated in the facility by one orthopedic team, consisting of one resident orthopedic surgeon and a visiting orthopedic surgeon as well as the support staff. The patients with traditional bone setters' gangrene and others who were hemodynamically unstable from toxemia or blood loss had the initial optimization with fluid therapy, antibiotics and tetanus prophylaxis, and blood transfusion for some of them with unacceptably low hemoglobin. Other investigations included measuring serum electrolytes, urea, and creatinine levels which were abnormal in two patients. All of the patients with bone setters' gangrene had provisional amputations and when they became more stable, the wounds were closed by secondary suturing. The documentations of these patients were kept as case files and left with the medical records department on discharge. Clearance for this study was obtained from the ethical committee of the center preceding the retrieval of these case files for analysis. Additional information was obtained from the operation registers that were kept as theater records.

The retrieval keywords were limb amputation and or gangrene and included folders marked from October 2007 to September 2015. Records of patients with specific diagnosis of bone setters' gangrene were included for analysis. Age, gender, diagnosis and treatment carried out, duration of hospital stay, and number of prosthetic fittings were recorded for analysis. The statistical analysis was done with the Statistical Package for Social Sciences by International Business Machine (IBM SPSS for windows) version 20.0, Armonk NY 2011 and the results were presented as frequency distribution and percentages in Tables 1, 2 and Figure 1.

Results

A total of 68 patients were analyzed within the 8 years period under review. Sixty-seven patients had limb amputations (98.5%). Eleven of the total number had bone setters' gangrene, ten patients had provisional amputations, and one refused amputation and had to be referred to another center. Seven were above the knee, two were below the knee, and one was above elbow amputations. The range of hospital

Table 1: Age and sex distribution of patients who had amputation and/or gangrene

Age (years)	Number (%)	Male	Female
0-9	2 (1.9)	2	0
10-19	5 (7.4)	3	2
20-29	4 (5.9)	4	0
30-39	19 (27.9)	18	1
40-49	16 (23.5)	16	0
50-59	7 (10.3)	5	2
60-69	9 (13.2)	8	1
70-79	4 (5.9)	4	0
80-89	2 (2.9)	2	0
Total	68 (100)	62 (91.2)	6 (8.8)

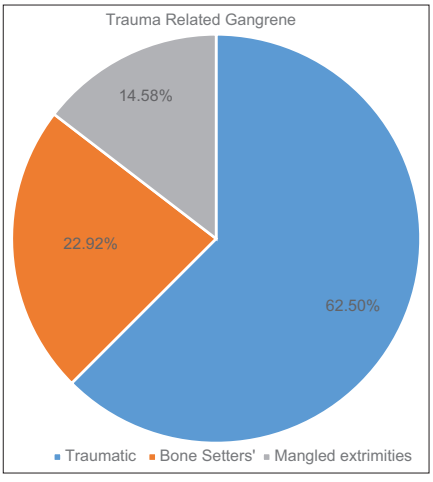

Figure 1: Pie chart showing distribution of trauma-related gangrene

Table 2: Crosstabulation of diagnosis with the type of treatment carried out

Diagnosis	Treatment carried out							
	A/K (%)	B/K (%)	A/E	Ray	Mid-tarsal	Total (%)	Definitive amputation	Provisional amputation
Traumatic gangrene	12 (41.4)	15 (60)	2	1	0	30 (44.7)	21	9
Diabetic gangrene	3 (10.3)	5 (20)	0	6	1	15 (22.3)	5	10
Bone setters' gangrene	7 (24.1)	2 (8)	1	0	0	10 (14.8)	0	10
Mangled extremity	4 (18.8)	3 (12)	0	0	0	7 (10.4)	4	3
Malignancy	3 (10.3)	0	0	0	0	3 (4.5)	3	0
Polydactyl	0	0	0	2	0	2 (3.3)	2	0
Total	29 (100)	25 (100)	3	9	1	67 (100)	35	32

A/K: Above knee, B/K: Below knee, A/E: Above elbow

stay was 5–9 weeks. There was no mortality in the traditional bone setters' gangrene group treated within the period under review. Six patients had prosthetic fittings in the long run. Young adult males were predominant in this study.

Discussion

Traditional bone setters' gangrene is a fairly common orthopedic emergency.[14] Fifteen percent of amputations in our center were due to bone setters' gangrene while nearly quarter of all trauma-related gangrene were bone setters' gangrene. The one patient that refused to give consent for amputation despite our counseling was referred to the government hospital for the second opinion, but we did not get a return referral. A similar study found bone setters' gangrene to have accounted for 86% of seventy trauma-related gangrene,[14] and it also reported that trauma was the commonest reason for amputation similar to our study. Due to the nature of the practice of the traditional bonesetters, including their penchant for zero documentation, it is difficult to know with certainty the nature and severity of the patients' injuries before the presentation to the traditional bone setters and before the application of the tight splints. There are occasions in which there could have been a major vascular compromise in the limb as a result of the initial trauma. Moreover, fracture hematoma and inflammatory exudates could cause compartment syndrome in the limb and this could have resolved conservatively by limb elevation or by fasciotomy; however, it is more likely to deteriorate into gangrene if a tight splint is applied as is usually the case with the traditional bone setters. It is more devastating in a situation where there was no fracture in the first place to warrant the application of a splint as was the case in one of our patients. For the purpose of our study, patients who left the traditional bone setters' homes for our center with gangrene of the limbs and especially with wooden or bamboo splints still in place have bone setters' gangrene.

While majority of primary traumatic gangrene are Gustillo type IIIC tibial fractures that present late for any vascular repair to be useful, bone setters' gangrene often results from the secondary injury inflicted on the patients by the use of tight splints. All of the patients complained of increasing pain after the splints were applied. This history is suggestive of compartment syndrome which is characterized by ischemic pain on a background of limb injury. The pain is usually out of proportion to the degree of injury. Unfortunately, this pain usually went unrecognized by the bone setters, as it was taken as normal response to the injury and tightness of the splint until it deteriorated into gangrene. Infection of skin blisters from the applied contaminated herbal and earthen concoctions ensues with the attendant risk of tetanus.[9] This condition is usually associated with systemic inflammatory response which causes the release of mediators. These mediators cause fever and toxemia and sometimes organ failure. All of the patients in this study presented in this state of toxemia and two had renal compromise. These patients required emergency resuscitation and treatment to remove the source of sepsis and toxemia within the shortest possible operation time and thus, to ensure the reversal of the systemic inflammatory response before it deteriorated into multiple organ failures. Adequate resuscitation was a prerequisite for the patient to be fit for anesthesia and the required surgical procedure of amputation. The underlying factor in this disease process is the ignorance of the traditional bone setters and their inability to recognize the early problems associated with tight splints. Educating them on splints and the associated dangers of improper application is a necessary tool in reducing the rate of gangrene. Instructional courses organized for bone setters in Southern Ethiopia helped in reducing the incidence of bone setters' gangrene and thus amputation.[3]

The male predominance in our study is similar to findings by other authors.[8,14,15] This may be explained by the fact that bone setters' gangrene is mostly trauma-related and trauma is more common in males. The age bracket of 20–49 years that was commonly affected also explains the young adult group that engages in daily high energy activities either to earn livelihood or for recreation and therefore more likely to sustain severe injuries to the limbs. The impression that bone setters' gangrene is more common in children because the pediatric patients cannot enforce removal of tight splints[16] is not supported by this study. However, the small number of patients in our study is not sufficient to draw statistical inference. Young adult males dominated in our study similar to other studies in our subregion[9,14,15] and the majority of these adult patients presented in our center with the tight splints in place. Onuminya *et al*.[16] reported a mean age of 10 years in 25 patients with complications of gangrene,

compartment syndrome, and cellulitis following traditional bone setter's splints. Another report from Gambia noted that children living in rural areas were more commonly affected, citing falls from height as the primary cause of trauma.[17] At present, the proliferation of competitive private schools in our subregion with controlled playgrounds and play devices may have contributed to a reduction in the number of children who sustain falls and fractures in schools.

Traumatic gangrene and diabetic gangrene were more common in the distal extremities of the lower limbs and treatment was more by a below knee amputation than by above knee amputation in our experience. Below knee amputation is preferable to above knee amputation because of easier rehabilitation except in a situation where there is already an ascending gangrene from delay. In this study, seven patients with bone setters' gangrene had above knee amputation because the gangrene extended to the knees and in some cases to the lower thighs. The extent of the gangrene was ascribed to the tight splint that spanned the entire length of the leg and also because of the delay in presentation. The delay in seeking orthodox treatment was also noted to be responsible for major limb amputations in diabetes who initially ascribed their foot lesions to poisons[18] and so wasted time in spiritual homes. The main concern about more proximal amputations is the increased difficulty of gait training and rehabilitation. Six out of the ten patients were able to get functional prosthesis at affordable costs, made possible by a standing arrangement our center has with a local orthotic and prosthetic company.

The high degree of toxemia and sepsis informed our choice of provisional amputation instead of the more time-consuming one stage definitive amputation. Wounds were left open for dressing and drainage and the patients were given the appropriate antibiotics. This was characterized by progressive resolution of the wound sepsis without any incidence of ascending infection. The wounds were closed by secondary suturing when the patients were more stable. Provisional amputation removed the source of sepsis quickly without upsetting so much, the inflammatory responses in these patients whose hemodynamic conditions were at best fairly stable. Prolonged and severe responses that may result from prolonged operation time and anesthesia are inimical to patients' survival. This approach was probably a factor in the zero operative mortality recorded in this study. More importantly, the adequacy of the resuscitation and the consequent absence of multiple organ failures in our patients could also account for the absence of mortality. Nwankwo and Katchy reported four deaths in their fifteen consecutive case series, citing severe sepsis as the reason for this mortality.[9] Onuminya *et al*. also reported eight deaths from a similar reason in a study of seventy traumatic gangrene, sixty of which were from tight traditional bone setters' splints.[14] However, we recorded few cases of wound sepsis that were easily controlled and without any incidence of ascending infection requiring revision amputation as reported by some authors.[19]

The major limitation of this study is the small number of patients with traditional bone setters' gangrene, which is not sufficient to draw statistical inferences. Pooling of data in the form of multicenter study may sustain any statistical deduction.

Conclusion

Bone setters' gangrene is common and it is the most devastating of all the complications arising from fracture and nonfracture treatment by the traditional bone setters. Provisional amputation, mostly above the knee, is done as a life-saving procedure as the first of a two-stage operation. The second stage of secondary closure is carried out later when the patient is more stable. The loss of a limb results in a lifetime disability and stigma and this impacts greatly on the patient and the family economically, especially as young males in their prime of youth are mostly affected. All efforts should be made to curtail this problem to the barest minimum or better still to eliminate it completely.

Recommendation

We recommend that any case of treated bone setters' gangrene should be an opportunity for the orthopedic team to educate the patient and the family members about the complications arising from traditional bone setters' treatments with the hope of forestalling future occurrences. Instructional courses should be organized for the bone setters with visual images on splints and gangrene. The Nigerian Orthopaedic Association should play a significant role in this regard. The traditional rulers should also help in formulating policies to control the bone setters operating in their communities.

Finally, the government should tackle the problems in the health sector that indirectly promote the patronage of the traditional bone setters such as subsidizing the cost of hospital treatment and promptly mediating in the incessant strikes in public hospitals. The National Health Insurance Scheme needs to be expanded to cover fracture treatment procedures. Appropriate supervision and control, legislation on unwarranted advertisements, and possibly sanctions should be extended to the bone setters as it is for orthodox health practitioners. This form of audit has improved performances in orthodox facilities and should be expected to do same in the traditional bone setters' homes.

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Conflicts of interest

There are no conflicts of interest.

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