Jurnal Kesehatan dan Pengembangan Terbaru

Vol 5, No 4, Oktober 2024
https://ejurnals.com/ojs/index.php/jkpt

THE HORROR COMPLICATIONS OF FRACTURES, CAUSED BY SANGKAL PUTUNG OR TRADITIONAL BONE SETTER, A SYSTEMATIC REVIEW

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ABSTRAK

Pendahuluan. Penataan tulang tradisional (TBS), tradisi yang sudah berlangsung lama, digambarkan sebagai seni penyembuhan paling kuno. Penataan tulang dan TBS sudah ada sejak ribuan tahun lalu, sebelum ada profesi medis yang terorganisasi. Praktik penata tulang tradisional (TBS) telah dikaitkan dengan hasil yang tidak dapat diterima dalam banyak kasus muskuloskeletal. Komplikasi yang timbul dari praktik mereka berkontribusi secara signifikan terhadap tantangan yang dihadapi oleh praktisi ortopedi. Tujuan. membandingkan komplikasi fraktur yang disebabkan oleh TBS dalam beberapa kasus di negara-negara berkembang. Metode. Pencarian komprehensif dilakukan pada bulan Agustus 2022 di mana kami mencari perpustakaan online Wiley, PubMed, Cochrane, ProQuest, dan basis data ScienceDirect. Pasien yang ditinjau dalam tinjauan sistematis ini adalah pasien pria dan wanita yang berusia di bawah 85 tahun. Ras dan durasi tindak lanjut tidak dipertimbangkan dalam tinjauan ini. Hasil. 295 artikel ditemukan dalam pencarian awal, yang 15 di antaranya dipilih untuk tinjauan sistematis. Komplikasi fraktur yang disebabkan oleh TBS meliputi: Fraktur nonunion, Fraktur malunited, Dislokasi sendi terabaikan, Fraktur terbuka yang terinfeksi. Terapi semua komplikasi ini dapat diatasi dengan baik oleh dokter ortopedi dengan ORIF, Amputasi, Sequestrectomy, pembalutan luka dan cangkok kulit, fisioterapi, pemasangan belat pop cast. Kesimpulan. Tukang tulang tradisional tidak menerima pelatihan formal dalam bidang tukang tulang. Akan tetapi, mereka menerima dukungan yang sangat besar dari masyarakat terutama karena kurangnya akses ke layanan ortopedi modern. Kelayakan dan penerimaan pelatihan formal tukang tulang tradisional yang ditunjukkan dalam penelitian ini telah memberikan kesempatan untuk meningkatkan pengetahuan dan keterampilan TBS.

Kata Kunci: Ortopedi, Fraktur, Malunited, Amputasi.

ABSTRACT

Introduction. Traditional bonesetting (TBS), an age long tradition, is described as the most ancient healing art. Bonesetting and TBS go back for thousands of years, before there was an organized medical profession. Traditional bone setter's (TBS) practice has been associated with unacceptable outcomes in many musculoskeletal cases. Complications arising from their practice significantly contribute to the challenges facing the orthopedic practitioner Objective. comparing fracture complications caused by TBS in several cases in developing countries Methods. A comprehensive

search was performed in August 2022 in wich were searched the wiley online library, PubMed, Cochrane, ProQuest, and ScienceDirect database. The patients reviewed in this systematic review were male and female patients younger than 85 years. Race and duration of follow-up were not considered in this review. Results. 295 articles were found in an initial search, of which 15 selected for a systematic review. Complications fracture caused by TBS included : Fracture nonunion, Malunited fracture, Neglected joint dislocation, infedcted open fracture. therapy of all these complications can be resolved properly by an orthopedic doctor with ORIF, Amputation, Sequestrectomy, wound dressing and skin grafting, phisiotherapy, pop cast splint. Conclusion. Traditional bonesetters receive no formal training in bonesetting. However, they receive huge patronage from the populace mainly due to lack of access to modern orthopaedic services. The feasibility and acceptability of formal training of traditional bonesetters demonstrated in this study has provided the opportunity for improving the knowledge and skills of the TBS.

Keywords: *Orthopedics, Fractures, Malunited, Amputation.*

INTRODUCTION

Traditional bonesetting (TBS), an age-long tradition, is described as the most ancient healing art [8]. Bonesetting and TBS go back for thousands of years, before there was an organized medical profession. Bonesetting was absorbed into orthopedic surgery approximately 120 years ago through a fortuitous accident of history, geography, and family connections. TBS in the Western nations were gradually replaced by orthopedist trained surgeon to treat fractures and dislocations. In the developing countries, TBS continue to ply their trade and they treat large proportion of patients with fractures and dislocations [9].

The number of deaths due to traffic accidents in Indonesia is still relatively low tall. According to WHO Statistics 2007, based on the number of deaths due to traffic accidents and estimated traffic accidents per 100,000 population, Among countries in Southeast Asia, Indonesia is in 1st place the most, namely 37,438 deaths or about 16.2 if estimated per 100,000 population. This shows that cases of fractures in Indonesia also more increasing [7]. In Papua Province, TBS is an age-long practice and existed long before the arrival of orthodox medicine, making the TBS enjoy high patronage from the community. There are 17.18% who choose TBS as their choice of treatment, and 81.67% using self-made concoctions [4].

In Papua Province, Indonesia TBS is an age-long practice and existed long before the arrival of orthodox medicine, making the TBS enjoy high patronage from the community. There are 17.18% who choose TBS as their choice of treatment, and 81.67% using self-made concoctions

[2]. Despite limitations in traditional practices, some demands or patient-related factors, such as ignorance, peers and family pressure, poor socioeconomic status, aversion for implants, fear of amputation, cultural beliefs, and affection of concoctions and incantations, contribute to the support of traditional medicine [3]

Traditional bone setter's (TBS) practice has been associated with unacceptable outcomes in many musculoskeletal cases. Complications arising from their practice significantly contribute to the challenges facing the orthopedic practitioner. These complications include malunion and nonunion from lack of radiographic imaging or proper reduction, compartment syndrome, Volkman's ischemic contracture and gangrene from constrictive immobilization, and infection from lack of sterility, prophylaxis, and scarification [5].

The practice of bone setting is unregulated and lacks the fundamental scientific principles of fracture management as well as infection prevention and control. The technique mainly applies herbal and earthen mixtures to the limbs and then improperly fixes them with wooden splints without resorting to anatomy, physiology, or radiology [10]. Frequently, the splint is tight, which can lead to compartment syndrome and gangrene or death of the limbs. Bone setter's gangrene occurs with a prevalence of 6.6%, and it is the most catastrophic of all complications arising from fracture and non-fracture treatment by the TBS. The only treatment for gangrene is amputation, and this is devastating to the patient and family members, even when it is the only life-saving option. The loss of the limb results in a lifetime disability and stigma, impacting the patient and the family [3].

With the patronage enjoyed by the TBS in many low - and middle - Income countries, complications of fracture care ranging from limb- to life-threatening conditions have persisted and remained a significant challenge to the orthopedic surgeons practicing. Some studies suggest that TBS can be trained in safe methods of fracture treatment as a means of controlling these preventable complications [11]. Because of the importance of educating and enlightening the public on traditional bone setters, where in our country Indonesia there are no regulations and certifications governing their practice, we present a study to provide solutions that we get from various articles in countries that have the same problem as that we are facing, either is to stimulate and invite traditional bone setters to provide training that is guided directly by orthopedic doctors [15].

RESEARCH METHODS

This systematic review was written based on the preferred reporting items for Systematic Reviews and Meta-Analysa (PRISMA) guidelines for reporting the events evaluated by interventions and health care behaviors [17]. Population, intervention, control, and outcome (PICO) question [18] used in this systematic review were.

P (population) : long bone fracture
I (intervention) : tradition or bonesetter
C (comparison) : open reduction with internal fixation
O (outcome) : neglected fracture

Eligibility criteria

This study reviews evidence from any design study with open-label treatment to assess of complications of fractures, caused by traditional bone setter. The patients reviewed in this systematic review were male and female patients younger than 85 years. Race and duration of follow-up were not considered in this review

Search strategy

A comprehensive search was performed in August 2022 in wich were searched the wiley online library, PubMed, Cochrane, ProQuest, and ScienceDirect database, using keywords related to long bone fracture, tradition or bonesetter, open reduction with internal fixation, neglected fracture without language restriction. The following keywords were used in searches of all database mentioned above “Long bone fracture” AND “Tradition or bonesetter” AND “Open reduction with internal fixation” AND “Neglected fracture”

Selection of studies

The criteria for inclusion and exclusion were determined before the searches. We included studies with add-on therapy or switching to traditional bone setter with or without other control or long bone fracture. Studies with relevant titles are then collected and filtered studies found in more than one database were removed. Full-paper manuscripts where then studied, and manuscripts that were irrelevant to the theme are excluded [18]. Four studies were included in a systematic review

from five database. There are 295 initial articles (93 articles from wiley online library, 42 articles from PubMed database, 4 articles from Cochrane online library, 103 articles from ProQuest and 43 articles from ScienceDirect). Because of the irrelevant titles. 279 articles were excluded and 9 articles were removed because of duplication titles. After articles reviewed, another 4 articles were excluded because of several reasons. The title and the abstract of the articles were reviewed again and at the results, only 3 studies were qualified to be analyzed.

Data extraction

Selected studies were further studied, the relevant information is extracted. Relevant information includes study types, patient characteristics, intervention regimens, comparative regimens (open reduction with internal fixation) neglected fracture and the methods used to analyze the results. The main outcome assessed was the complication of fracture caused by sangkal putung or traditional bone setter compare with baseline.

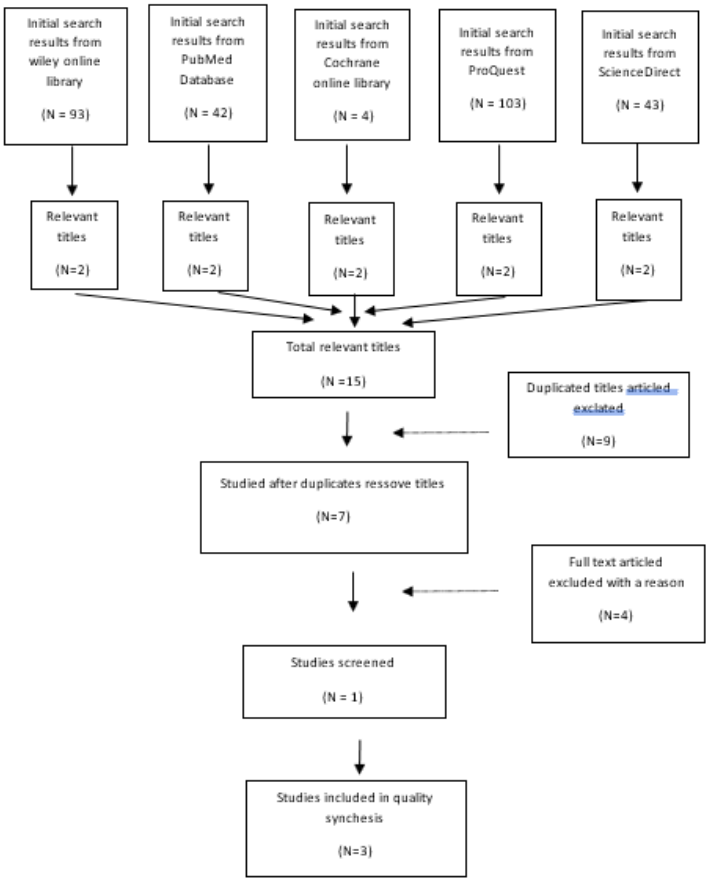

Fig.1 Diagram Flow of the Article Selection

RESULTS AND DISCUSSION

Results

The diagram flow of the selction of articles was shown in fig. 1 with a total of 3 articles chosen from 295 initial articles. All of the selected studies have been conducted in the last 15 years and from Nigeria (1), India (1), Ethiopia (1), TBS (17.4%), dissatisfaction with orthodox care (21.7%), high cost of hospital care (17.4%), patient was on transit (4.3%), and strike by health workers (4.3%). As shown in Table 3, more than half of the patients (53.3%) presented with fracture nonunion, 4 (8.9%) had neglected dislocations and 4.4% had gangrenous limb. Twenty-two (47.8%) patients were advised by relations to patronised TBS; 16 (34.8%) by friends and 8 (17.4%) on personal preference. A patient was advised by both relations and friends. The reasons for the initial preference in TBS care included; believed they were better in bone treatment, 61.1%. Operative treatment; which included open reduction and internal fixation with plate and screws or intramedullary nail ± bone grafting (53.3%), open reduction and external fixation ± limb lengthening (8.9%); was an important option in rectifying the complications of TBS treatment. Two (4.4%) of the patients had limb amputation and 4 (8.9%) defaulted from continue care [1].

from indian artcle Nearly 51% patients were educated above matric and 55% patients expressed that old treated patients were the means of contact of this center Fresh cases were 80 out of 146 (55%) which was dominant in this study and fracture of radius/ulna was found to be more in this study Maximum patients responded that traditional skill is the only way to patronize this treatment . Maximum patients [i.e. 37 out of 52 (71%)] were satisfied with this treatment, and loss of joint movement was observed in only one case (2%) followed by malunion, nonunion and delayed union. No case complained about gangrene and Volkmann's ischemic contracture [19].

the ethiopia article mentions that In a two-year period (2018-2019) 14 male adolescents aged 7 to 17 were operated in the hospital of the Salesian Sisters in Adwa. Besides a 28-year old woman and a 12-year-old boy, snakebite victims, underwent surgery with VIC extensors. The males had fractured forearms (9) wrist (3) and supra condyloid (2). During the acute phase they had been treated by the "bone-setters" in their villages using traditional methods and namely tight bandaging and/or the application of rudimentary sticks, such as bamboo canes, kept for several days. Patients were all from rural villages, far away from any health care structures and due to economical and/or

mentality reasons do not ask for the opinion of health care operators (who normally work in cities distant from the villages) [20].

Table 1 : Summary of Data Description from the Included Studies

Study	Subject criteria and study design	Location	Intervention	Length of follow up	outcome
Yusuf et al 2015	During the study period, 810 patients were admitted and managed for limb injuries, 131 left against medical advice during same period, and 45 (5,6% of patient managed for limb injuries) presented after TBS intervention. The age of patient with TBS intervention range to 3 – 85 years. With mean age of 38.3, 20.7 years. Data were analyzed using SPSS inc, Chicago, USA	Nigeria	ORIF with plate and screw, 24 (53.3%) OREF limb lengthening, 4 (8,9%) Open reduction and triceplasty, 2 (4,4%) Amputation 2 (4,4%)	3 years	There was no postintervention complication 37 (90,2%) Persistence neurologic deficit 2 (4,9%) Flap necrosis 1 (2,4%)

Avurveda et al 2011	The present study was carried out at Puttur town and Rachapalem/Eswarapuram village in Chittur district of Andhra Pradesh state. It is nearly 125 km from Chennai and 25 km from Tirupati on the Chennai–Tirupati National Highway. A total of 146 patients were interviewed by our research team and 52 patients were followed up to the end stage of treatment. Most of the patients (65%) were in the age group of 0–20 years and there was a dominance of male patients (55.48%) in this study. The data obtained were recorded and analyzed on Microsoft Excel	India	they twist, pull and poke the arm or leg to locate the exact dislocation or fracture. they dip a piece of gauge into the paste of the medicinal herb and tie it around the area of dislocation or fracture. To immobilize the area of injury, they tie up short pieces of bamboo sticks with a bandage	3 years	Maximum patients [i.e. 37 out of 52 (71%)] were satisfied with this treatment, and loss of joint movement was observed in only one case (2%) followed by malunion, nonunion and delayed union. No case complained about gangrene and Volkmann's ischemic contracture

Cugola et al 2021	All partecipants provided written informed consent to participate in this study. This study was conducted under the principles of Declaration of Helsinki. 14 male adolescents aged 7 to 17 were operated in the hospital of the Salesian Sisters in Adwa. Besides a 28-yearold woman and a 12-year-old boy , snakebite victims, underwent surgery with VIC extensors. The males had fractured forearms (9) wrist (3) and supracondyloid (2). During the acute phase they had been treated by the "bone-setters" in their villages using traditional methods and namely tight bandaging and/or the application of rudimentary sticks, such as bamboo canes, kept for several days.	Ethiopia	Z-type flexor tendons lengthening, proximal heads of the superficial flexors pro distal stumps of profondous flexors transfer, transfer of carpi radialis long extensor pro deep flexors fingers and BR pro FLP	2 years	Subjective improvement in dexterity evaluated on the basis of 10 a grade scale amounted to 6.5 (2,3 before operation)

Discussion

Complications of fracture can occur spontaneously, because it is iatrogenic or by because of the treatment. Complications are generally due to three main factors, namely: local pressure, excessive traction, and infection [16]. Complications by consequence Treatment (iatrogenic) is generally preventable. Complications of fractures to organs include: Complications on the skin wich is Lesions due to pressure, Ulceration due to pressure sores, Ulceration due to plaster cast. And Complications in blood vessels wich is Ulceration due to plaster cast, Lesions due to traction and compression, Volkmann Is ischemia, Gangrene [11]. And then Complications on the nerves wich is Lesions due to traction and compression and Complications in the joints wich is Infection (septic arthritis) due to open surgery in closed trauma. And Complications in the bones wich is Infection due to open surgery in closed trauma (osteomyelitis), Epiphyseal and epiphyseal plate complications in pediatric fractures [12].

Referring from the three articles During the study period in Nigeria, 810 patients were admitted and managed for limb injuries, 131 left against medical advice during same period, and 45 (5.6% of patients managed for limb injuries) presented after TBS interventions. The ages of patients with TBS interventions ranged from 3 to 85 years with mean age of 38.3 ± 20.7 years, 29 were male and 16 were female with male: female of 1.8:1. Twenty-nine (64.4%) of the patient had their injury from road traffic crash; 14 (31.1%) from fall; and 1 (2.2%) each from assault and industrial accident. The time interval between the injury and presentation at the study center for rectification ranged from 1 to 275 weeks, with median of 17.00 weeks. more than half of the patients (53.3%)presented with fracture nonunion, 4 (8.9%) had neglected dislocations and 4.4% had gangrenous limb Twenty-two (47.8%) patients were advised by relations to patronised TBS; 16 (34.8%) by friends and 8 (17.4%) on personal preference. A patient was advised by both relations and friends. The reasons for the initial preference in TBS care included; believed they were better in bone treatment, 61.1%. Operative treatment; which included open reduction and internal fixation with plate and screws or intramedullary nail ± bone grafting (53.3%), open reduction and external fixation ± limb lengthening (8.9%); was an important option in rectifying the complications of TBS treatment. Two (4.4%) of the patients had limb amputation and 4 (8.9%) defaulted from continue care [1].

Table 2: Types of the injury

Site of injury	Frequency (%)
Humeral fractures	7 (15.6)
Radioulnar fractures	5 (11.10)
Femoral fractures	17 (37.8)
Tibiofibular fractures	9 (20.0)
Clavicular fracture	1 (2.2)
Dislocations (shoulder, elbow, metacarpophalangeal joint)	4 (8.9)
Multiple fracture	1 (2.2)
Brachial plexus injury	1 (2.2)
Total	45 (100)

Table 3: Post-TBS treatment diagnosis

Post-TBS diagnosis	Frequency (%)
Fracture nonunion	24 (53.3)
Malunited fracture	5 (11.1)
Neglected joint dislocation	4 (8.9)
Infected open fracture	3 (6.9)
Malunited fracture with chronic osteomyelitis	2 (4.4)
Limb gangrene	2 (4.4)
Delayed union	2 (4.4)
Frracture with compartment syndrome	1 (2.2)
Brachial plexus injury	1 (2.2)

Two bones fracture union	1 (2.2)
Toatal	45 (100)

aditional bone setting practices are quite popular in India and nearly 6000 traditional bone setting Vaidyas (Practisioners) are practicing the same in our country. Puttur kattu is a traditional way of bone setting practice, invented accidentally by K. Kesava Raju in 1881. Now, the fourth generation of his family is practicing this bone setting practice in hospitals at Puttur, Andhra Pradesh, with 200–300 patients per day. There are two bone setting hospitals with both out and in patient facilities in the Rachapalem village. The small hospital is managed by Kadallam Subramnu Raju and the big one by Suprapanaju Krishnanan Raju of the Raju community [19].

The big hospital has 50 beds of its own, and the Tirupati Devasthanam Trust has donated an additional 25-bedded building. The big hospital has a big hall for bone setting, computerized registration counter, waiting hall with TV and a pharmacy. There are 10 tables for bandage and plaster. They have 7 experts, 25 attendants and 4 office staff. They collect only ` 15.00 from the patients for registration, and the patients have to buy cloth, cotton and eggs from the pharmacy for another ` 10.00 to 30.00 Rupee. The consultation charge is free for poor people, but they are collecting a nominal fee ranging from ` 50.00 to 100.00 Rupee at the end of the treatment from all patients. The hospital is open on all seven days of the week from 7.30 AM to 6.30 PM with 1-hour lunch break from 1.30 PM to 2.30 PM. Like orthopedicians, they do not use expensive hospital equipments and medicine. They have no X-ray unit in their campus. Patients bring their X-rays, but X-rays are given less importance. Only the blood sugar levels of the patients are sometimes asked for. A total of 146 patients were interviewed by our research team and 52 patients were followed up to the end stage of treatment [19].

Maximum patients responded that traditional skill is the only way to patronize this treatment. Maximum patients [i.e. 37 out of 52 (71%)] were satisfied with this treatment, and loss of joint movement was observed in only one case (2%) followed by malunion, nonunion and delayed union (Table 5). No case complained about gangrene and Volkmann’s ischemic contracture [19].

Table 4 : Pathologies of fractures and dislocations found in 146 attended patients in india

Pathology	Site	No of patients (%)
Fracture Femur	07	(4.7)
Tibia	10	(6.8)
Radius/ulna	25	(17)
Humerus 1	6	(11)
Pott's	03	
Collis	18	(12.32)
Barton	02	
John's 1	9	(13)
Dislocation Hip	05	
Elbow	19	(13)
Wrist	15	(10.27)
Tarsal/meta tarsal	18	(12.32)
Total 14		

Table 5: Patients' satisfaction/complaints after treatment by Puttur TBS (n = 52)

Patients' satisfaction/complaints	No of patients (%)
Satisfied	37 (71)
Cellulites	05
Malunion	03
Nonunion	01
Delayed union	02
Stiffness of joint	03
Loss of joint motion	01
Volkmann's ischemic contracture	Nil
Gangrene	Nil
Total 52	

This article learn about VIC where there is no complication because TBS in india, especially Volkmann's ischemic contracture. Because the article we chose from ethiopia is very specific about VIC, where this case does not exist in our other articles. Richard von Volkmann, German surgeon, described the "non-infective ischaemic conditions of various fascial compartments in the extremities" , as the outcome of an acute compartment syndrome, in 1881. In 1890 Hildebrand used for the first time the term "Volkmann's contracture (VIC)". We focus on the clinical outcome and relevant treatment. The contracture (irreversible with an ischaemia longer than 6-12 hours-12-18) depends from the muscle replaced by fibroblastic tissue resulting in adherences in the interested area. The fibrotic tissue shall reach maturation in 6-12 months, graduating the severity of the con tracture, involving the adjacent nerves either by compression or by reducing their blood flow and sliding [20].

In a two-year period (2018-2019) 14 male adolescents aged 7 to 17 were operated in the hospital of the Salesian Sisters in Adwa. Besides a 28-year old woman and a 12-year-old boy (fig. 2), snakebite victims, underwent surgery with VIC extensors. The males had fractured forearms (9) wrist (3) and supracondyloid (2). During the acute phase they had been treated by the "bone-setters" in their villages using traditional methods and namely tight bandaging and/or the application of rudimentary sticks, such as bamboo canes, kept for several days. Patients were all from rural villages, far away from any health care structures and due to economical and/or mentality reasons do not ask for the opinion of health care operators (who normally work in cities distant from the villages). The wide range of clinical spectrum cannot be adequately classified while it is necessary to underline that Holden divides VIC into two levels: 1. where the insult is proximal to the ischemic/contracture area; 2. the insult is located at the very area of ischemia/ contracture [20].

MILD: DEEP FLEXOR muscles affected. No NERVE involvement.

MODERATE: the muscle bellies of the DEEP flexors, the LONG FLEXOR of the thumb and in part the SUPERFICIAL flexors are affected. Various degrees of nerve involvement.

SEVERE: degeneration of all FLEXORS with variable involvement of the extensors. Severe nerve impairment.

Surgery was performed under plexus anesthesia with standard volar incision and excision of necrotic tissue, if present. Techniques were placed according to the degree of contracture, Z-type flexor tendons lenghtening, proximal heads of the superficial flexors pro distal stumps of profondous flexors transfer (in 8 moder- ate severe cases, transfer of carpi radialis long extensor pro deep flexors fingers and BR pro FLP [20]

In two moderate cases, the treatment had started with epitrochlear muscle dissection, according to Page-Scaglietti's technique (6-7), without obtaining a satisfactory release of the contracture, and then flexor lengthening was also performed. In a 9-year-old patient with severe wrist stiffness, a proximal carpectomy was also performed, and in an- other 17-year-old patient, wrist arthrodesis was per- formed for outcomes of a badly consolidated fracture . Although it is difficult to verify the results because of the scarce overlapping of the clinical pictures and the different operations, in all an improving modification of the deformity aspect with an accept- able recovery of the hand function in a useful range of flexion-extension of the fingers and of wrist and grip was encountered. Sensibility also benefited (which, as mentioned, was never greatly compromised, limiting treatment to neurolysis) [20]

CONCLUSION

Complications of TBS are always present in every article we study, especially in developing countries. Most of the orthopaedists felt that traditional bonesetters were an inevitable part of society and were filling a gap caused by the shortage of orthopaedists in developing countries. How- ever, all the orthopaedists expressed that although the traditional bonesetters were filling a gap, they were causing a lot of havoc due to the huge complications associated with their practice. They noted that most of the complications resulted from mismanagement of fractures, particularly the application of splints that were too tight. Traditional bonesetters receive no formal training in bonesetting. However, they receive huge patronage from the populace mainly due to lack of access to modern orthopaedic services. The feasibility and acceptability of formal training of traditional bonesetters needed for improving the knowledge and skills of the TBS. the orthopaedists, stakeholders and the TBS admit that standardized and formalized training will ultimately improve the quallity of services and outcomes of their fracture treatment by TBS. The integration of the trained TBS into primary healthcare system as orthopaedic technicians will transform the trauma system in developing countries.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

A. Yusuf MB, Popoola SO, Oluwadiya KS, Ogunlusi JD, Ige OE. Management of complication of age-long tradition presented at Ado-Ekiti, southwest Nigeria. African journal of trauma. 2015;4:16-20. DOI: 10.4103/1597-1112.169812

Luhur LJ, Dharmawan IPG, Wiguna ILNAA, A catastrophic presentation of dead limb secondary to traditional bone setter's treatment in Sorong, West Papua: A case report. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. Available online 11 June 2021 https://doi.org/10.1016/j.ijscr.2021.106061

Onyemaechi NO, Itanyi IU, Ossai PO, Ezeanolue EE. Can traditional bonesetters become trained technicians? Feasibility study among a cohort of Nigerian traditional bonesetters. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. The Author(s). 2020 Open Access https://doi.org/10.1016/j.ijscr.2021.106061

Nayagam S, Salomon, Louis., Warwick, David. Apley`s System of Orthopaedics and Fractures. 9th ed. London: Hodder Arnold; 2010.

Adi Mahartha GR, Maliawan S, Kawiyana KS. Management of fracture of musculosceletal trauma. E-journal Medika Udayana. 2013;2(3):548–60.

Nwachukwu BU, Okwesili IC, Harris MB, Katz JN. Traditional bonesetters and contemporary orthopaedic fracture care in a developing nation: historical aspects, contemporary status and future directions. Open Orthop J. 2011;5(1):20–5.

Sari AP, Priambodo A, Pramono D. Faktor-faktor yang berhubungan dengan keterlambatan berobat pada pasien patah tulang yang menggunakan sistem pembiayaan jamkesmas (Studi Kasus di RSUP Dr. Kariadi Semarang Tahun 2012). Medico. 2012;1(1):1–13.

Ekere A, Echem R. Patronage of traditional bone setters for musculoskeletal conditions: A one-year study. Port Harcourt Med J. 2012;6(2):215–24.

Onyemaechi NO, Lasebikan OA, Elachi IC, Popoola SO, Oluwadiya KS. Patronage of traditional bonesetters in Makurdi, NorthCentral Nigeria. Patient Pref Adherence. 2015;9(1):275–9.

Wahyudiputra AG, Khoirur HD, Hakim RA, Narendra MR. Spektrum Penderita Neglected Fracture di RSUD dr. Abdoer Rahem–Januari 2012 s/d Desember 2013. CDK. 2015;42(2):97–100.

Onyemaechi NOC. Complications of musculoskeletal injuries treated by traditional bonesetters in a developingcountry. Indian J Appl Res. 2014;4(3):313–6.

Owumi B, Taiwo PA, Olorunnisola A. Utilization of traditional bone-setters in the treatment of bone fracture in Ibadan North Local Government. Int J Humanities Soc Science Invention. 2013;2(5):47–57.

Dada A, Giwa S, Yinusa W, Ugbeye M, Gbadegesin S. Complications of treatment of musculoskeletal injuries by bone setters. West Afr J Med. 2009;28(1):333–7.

Selin H. Encyclopaedia of the History of Science, Technology, and Medicine in NonWestern Cultures. 2nd ed. Massachusetts: Springer Science & Business Media; 2013.

Eze KC. Complications and co-morbidities in radiographs of patients in traditional bone setters' homes in Ogwa, Edo State, Nigeria: a community-based study. Eur J Radiol. 2012;81(9):2323–

Chowdhury M, Khandker H, Ahsan K, Mostafa D. Complications of fracture

BiomedcentraPrisma.https://systematicreviewsjournal.biomedcentral.com/articles/10.1186/s13643-021-01626-4

Evidence Based Medicine: PICO. https://mcw.libguides.com/EBM/PICO

Panda AK, Rout S. Puttur kattu (bandage) – A traditional bone setting practice in south India. Journal of Ayurveda & Integrative Medicine | October-December 2011 | Vol 2 | Issue 4. DOI: 10.4103/0975-9476.90766

Cugola L, Fasolo G. Clinical and demographic profile Volkmann's ischemic contracture presenting in Tigray (Ethiopia). Acta Biomed 2021; Vol. 92, Supplement 3: e2021562. DOI: 10.23750/abm.v92iS3.12557