

Outcomes of SIGN Hip Constructs Among Patients Treated at Kumi Orthopaedic Center

John Ekure¹, Naomi Amuron², Douglas Kilama¹, Phillip Buluma¹, Bashir Masembe³, Saviour Kicaber³ and Faith Akello^{4*}

¹MMed in Orthopaedic Surgery, Kumi Orthopaedic Center, Uganda.

²MMed in Orthopaedic Surgery, Soroti University, College of Health Sciences, Uganda.

³Bachelor of Medicine and Bachelor of Surgery, Kumi Orthopaedic Center, Uganda.

⁴MSc in Clinical Epidemiology and Biostatistics, Kumi Orthopaedic Center, Uganda.

ABSTRACT

Introduction: Hip fracture rates in Africa are expected to rise significantly over the next years. This is largely due to the aging population and the associated rise in the prevalence of osteoporosis. Hip fractures have the greatest health and economic impact. The Surgical Implant Generation Network (SIGN) Hip Construct was developed to treat patients with hip fractures without the aid of fluoroscopic imaging. This has been used on a number of patients in Uganda. However, there is no documentation of the long-term outcomes following fixation with these Hip constructs in Uganda.

Methods: This was a retrospective analysis of 11 patients that had been treated using SIGN hip construct from 2009 to 2019 using the SIGN online surgical database. Patients with a follow-up greater than 12 weeks and adequate radiographs were included. Data analyzed included the patient socio-demographics, clinical characteristics and surgical outcomes.

Results: Eleven patients were analyzed, eight males and three females with a mean age of 57.7 years (± 25.7). Majority, 8(72.7%), had intertrochanteric fractures and classified as 31A3 6(54.6%) according to AO classification. During surgery 8(72.7%) had a side plate used.

On follow up, the median follow-up period was 4 months (IQR: 3-72 months) with a range of 3 to 72 months. The success rate following clinical assessment of squat and smile was 81.8%. On radiological assessment 8 (72.7%) had healing on x-ray while 3 (27.3%) did not show healing on x-ray. Of those that did not show healing on x-ray, 1 had early implant failure, another one had proximal nail migration 4 months later and another had an early varus fracture collapse after 2 months. There was no case of mal-union noted following fixation using the hip constructs.

Conclusion: The SIGN hip construct can be used comfortably and with ease to fix fractures of the proximal femur in the absence of intraoperative image intensifiers. It offers acceptable clinical and radiological outcomes.

Keywords

Hip fracture, SIGN hip construct, SIGN online Surgical Database.

Corresponding Author Information

Faith Akello, MSc in Clinical Epidemiology and Biostatistics, Kumi Orthopaedic Center; Plot 30/32-34 Kumi, Malera Road, P.O Box 376, Kumi-Uganda.

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Introduction

Recently, the elderly with hip fractures have become an increasingly serious public health problem worldwide. As the global society continues to age, the number of elderly patients with hip fractures has increased dramatically [1,2]. It is estimated that by the middle of this century, more than 6 million individuals will suffer from hip fractures each year around the world, and most of them will be elderly [3]. Developing countries in Asia, Africa and Latin America are predicted to experience the largest growth due to the aging population and increasing prevalence of Osteoporosis [4]. Hip fractures represent a widespread health challenge usually characterized by high morbidity, mortality and substantial costs [5]. While specific data for Uganda may be limited, studies suggest a high prevalence of hip fractures, particularly among women in the elderly population, whose proportion is increasing in Sub-Saharan Africa [1,6]. These fractures most often result from low-energy falls in older patients or less commonly from high-energy trauma in younger patients [7]. These fractures are typically stabilized with either a sliding hip screw or a cephalomedullary nail with the latter preferred for unstable patterns [8-10]. However, the need for fluoroscopy for insertion and high cost of these implants are substantial barriers to treating hip fractures in low-income countries like Uganda. The SIGN hip construct (SHC) was therefore designed to overcome these barriers. The SHC uses simple hand instruments combined with an open reduction to diminish the need for fluoroscopy [11]. These were used on patients managed for hip fractures at Kumi Orthopaedic Center. However, their surgical outcomes were not assessed hence the study.

Materials and Methods

This was a retrospective study of the patients who were managed for hip fractures using SHC at Kumi Orthopaedic Center from 2009 to 2019. Data was extracted from the SIGN Surgical online database. There were 23 patients meeting this criterion. These cases were subsequently reviewed manually and excluded if they had incomplete data, inadequate radiographs, primary diagnosis of non-union, non-standard technique and follow up less than 12 weeks. Final analysis had 11 patients. The demographics extracted included age, sex, fracture site and fracture characteristics (fracture pattern). The outcomes assessed were healing on radiographs, clinical squat and smile, and any complications following surgery.

The data was extracted onto an excel sheet and analyzed using Stata Version 17.0.

Results

The mean age of participants was 57.7 years (± 25.71) of whom 8(72.7%) were male. Majority 8(72.7%) had intertrochanteric fractures, 2(18.2%) had sub trochanteric fractures, and 1 (9.1%) had fracture of the proximal femur. According to AO classification of fracture types, majority 6(54.6%) were 31A3, 2(18.2%) were 31A1, 2(18.2%) were 31A2 and 1(9.1%) was classified as 32A2. During surgery 8(72.7%) had a side plate used and 3(27.3%) did not have a side plate used (Table 1).

Table 1: Socio-demographic and clinical characteristic of the 11 participants.

Characteristics	Frequency (n=11)	Percentage (%)
Age: mean(SD)	57.7(± 25.7)	
Sex		
Female	3	27.3
Male	8	72.7
Mechanism of injury		
RTA	5	45.5
Fall	5	45.5
Mechanical	1	9.1
Side		
Left	7	63.6
Right	4	36.4
Fracture site		
Intertrochanteric	8	72.7
Sub trochanteric	2	18.2
Proximal femur shaft	1	9.1
AO type		
31A1	2	18.2
31A2	2	18.2
31A3	6	54.5
32A2	1	9.1
Mean time from injury to surgery(days)	6.45(± 4.4)	
Have side plate used		
Yes	8	72.7
No	3	27.3

The follow up rate at least 4 months after surgery was 47.8% (11 patients had a follow up visit). On clinical examination, 9 (81.8%) of the patients showed excellent results on "squat and smile" examination. However, on radiographic examination 8 (72.7%) of the patients showed healing (Table 2). Three patients recorded complications: 1 had early implant failure, another had nail proximal migration 4 months later and the other had early varus fracture collapse after 2 months.

Table 2: Outcomes of the patients at follow up.

Parameter	Frequency n (%) N=11
Follow up period: median(IQR)	4(3,72)
Healing on radiograph	
Yes	8(72.7)
No	3(27.3)
Squat and smile	
Yes	9(81.8)
No	2(18.2)

Discussion

Hip fracture fixation despite being a common orthopaedic procedure, remains an unsolved problem in low and middle-income countries where many patients are still treated in traction with prolonged non-weight bearing [12]. They are a common

consequence of falls in older people and are devastating in terms of their impact on an individual's health and abilities.

In our study, it was agreeably seen that most of the hip fractures were among older patients with a mean age of 57.7 years. This is explained by the fact that health of bones, muscles and joints commonly deteriorates with advancing age. With increased age, there is a decrease in bone mineral density as well as muscle mass and strength [13] and thus predisposing them to fractures.

The commonest mechanisms of injury were a fall (45.5%) and Road traffic Accidents (45.5%). The falls can be attributed to the decreased bone density, muscle mass and strength which increase the risk of falls and fall related injuries [14]. The RTA can be explained by the effects of urbanization coupled with increase in unqualified drivers/riders, nature of roads and poor vehicle conditions especially in rural regions [15].

The commonest fracture type was 31A3 (54.5%). This is contrary to majority of studies that have showed that the most common fracture classification to be 31A2 among patients [16,17]. The increased severity of fractures in this study can be attributed to high-energy trauma i.e. approximately 45.5% of injuries were caused by road traffic accidents.

The healing rate among the patients with follow up visits was 72.7 % with an overall complication rate of 27.3%. This complication rate is slightly higher than 21.1 % that was reported in a study that reviewed SIGN data from African countries like Cameroon, Somaliland, Ethiopia, Kenya and Tanzania [12]. This could be attributed to difference in characteristics of the study populations for example the study population among patients in the KOC study was older with a mean age of 57.7 years compared to mean age of 49.5 in the study by Justin Roth. Additionally, our study population had more complex injury patterns compared to those in Justin Roth's study.

In comparison with other surgical techniques used in the management of proximal femoral fractures, the complication rate for sign hip constructs is higher than 11.7% that was found in Germany among patients with trochanteric fractures treated by intramedullary nailing with a sliding screw device [18]. It is also higher than the complication rate of 8 % and 4% found among patients in whom proximal femoral nail and Medoff sliding plate were used respectively, in Sweden [19]. However, a higher complication rate in our study could be attributed to the more complex injuries and these all occurred in patients who did not have a side plate used. These side plates are important for augmenting complex fractures helping to enhance stability and promote early mobilization.

Time to union and fracture healing were difficult to assess because of the inconsistent follow-up intervals. We therefore reported the union rate at final follow up rather than time to union. The limitations of our study include the fact that it is a retrospective

study therefore subject to missing data and limited to the available data. There was also lack of a comparison group, irregular patient follow-up intervals and more than 50% loss to follow-up. Additionally, there is lack of data on functional patient outcomes such as health-related quality of life.

Despite these limitations, our study reports the outcomes of a novel implant that can be used in low-resource settings for the management of hip fractures.

Conclusion

Proximal femoral fractures were successfully treated with SHC in the study. This preliminary data suggests that SHCs can be safely inserted in the absence of fluoroscopy with acceptable outcomes in low and medium resource settings.

Recommendation

SIGN hip contracts are better used with side plates especially in complex fractures so as to enhance stability and thus reduce the occurrence of failures /complications.

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