CENTER OF EXCELLENCE FOR OPEN SCIENCE

Open Access

Email: cor@ceospublishers.com

CEOS Orthopedics and Rheumatology

Research Article

Received date: September 10, 2021

Accepted date: October 10 2021

Published date: October 12 2021

***Corresponding Author**

Bakriga B, Department of Orthopaedics and Traumatology Surgery, Faculty of Health Sciences, University of Lomé, Togo,
Tel: +22890083878,
E-mail: bakriga@gmail.com

Citation

Bakriga B, Ayouba G, Domtse M, Dellanh Y, Kombate N, et al. (2021) Management and Outcomes of Periprosthetic Fractures around the Femoral Stem in Hip Arthroplasties. CEOS Orthop Rheumatol 1(1): 101

Management and Outcomes of Periprosthetic Fractures around the Femoral Stem in Hip Arthroplasties

Bakriga B[*1], Ayouba G[1], Domtse M[1], Dellanh Y[1], Kombate N[2], Akloa K[1], Towoezim T[1] and Abalo A[1]

[1]Department of Orthopaedics and Traumatology Surgery, Faculty of Health Sciences, University of Lomé, Togo

[2]Sylvanus Olympio University Teaching Hospital, Lomé, Togo

Abstract

Introduction: The purpose of this study was to present the management of periprosthetic fractures (PF) of totalhip arthroplasty (THA) and the outcomes.

Materials and methods: It was a prospective study of patients treated in the orthopedic trauma department for a femoral Periprosthetic fracture of THA from January to October, 2018. According to the type of fracture, sealing ofthe implant, and the characteristics of patients, the decision of PF treatment was dependent on the Vancouver Type.

Results: Based on the Vancouver classification, this study of 22 periprosthetic fractures (PFs) around the femoral stem in hip arthroplasties of a series of 102 femoral fractures, revealed 2 type A, 10 B1, 2 B2, 5 B3, and 3 type C fractures. The type A fractures were treated conservatively. Two of the type B1 fractures had non-operative treatment and 8 had open reduce internal fixation (ORIF). Type B2 fractures were operated with an LCP hook reconstruction plate and Dall–Miles cables. Four type B3 had a change of prosthesis. Three type C fractures wereoperated with an LCP and Dall–Miles cables. Of the 22 patients treated for PF, 2 died, 18 were healed, 1 had a non-union, and 1 had a new fracture on the same bone.

Discussion: In this series, we found two fractures of the greater trochanter type A by the Vancouver classification. An unmoved bill received a non-operative treatment, and the second, corresponding to the iatrogenic intraoperative fracture, was osteosynthesis by an LCP hook plate and Dall–Miles cables.

Conclusion: This study confirms that the Vancouver classification is a simple reproducible classification system.Conservative treatment is a valid option if the implant is stable, while surgical intervention is mandatory if the implant is loose.

Keywords:

Management; Periprosthetic Fractures; Femoral Stems; Vancouver Classification; Osteosynthesis

Introduction

Periprosthetic fractures (PF) are fractures associated with an orthopedic implant, which is either a replacement or an internal fixation device. The global incidence of all types of PF is continually increasing due to the growing number of primary joint arthroplasties and revision surgeries. Management of PF around the femoral stem after total hip arthroplasty (THA) represents a significant challenge and the optimal treatment remains controversial [1]. The number of these fractures increases exponentially for several reasons including that the number of primary prostheses posed increases in parallel with the increase of the life expectancy of the population. The excellent results achieved with modern implants has led to an expansion of indications, especially in younger and more active subjects, who will live even longer with their prostheses in place and also be more at risk of trauma during their life [2-4]. PFs mainly occur in the elderly, and this often results in considerable morbidity and disability with significant socioeconomic consequences. On average, the estimated cost of treatment is between $20,000 and $200,000 US [5]. This study aimed to present the management of periprosthetic femoral fractures of THA orintermediate hip arthroplasty (IHA) and the outcomes.

Material and Methods

This was a prospective study of patients treated in the orthopedic trauma department for a femoral periprosthetic fracture of the THA or IHA from January 2018 to October 2018 at the Moulins Yzeure Hospital (CHMY) France. In total, 22 PFs in 22 adult patients of a series of 102 femoral fractures of both sexes were included following oral consent and treated for a femoral fracture of the THA or IHA. Patients with fracture ipsilateral knee arthroplasty, an acetabular fracture, or acetabular loosening were excluded. Several classifications are used to describe periprosthetic femoral fractures, including the Vancouver model described by Ducan and Masri, which takes into account the fracture site location, implant stability, and bone stock quality [6]; the use of this classification was based on standard radiographs. Non-operative treatment was used for traction glued in the axis of the limb, or simply bed rest for a few days until the pain eased. The limb was then mobilized gradually until a sufficient flexion, about 80° of the hip and knee, was attained to allow the patient to be placed in the chair. Resumption of support was guided by indolence and a radiography of the fracture followed. The indication of orthopedic treatment may arise if the expected result is acceptable: 1 cm of shortening and 15° of rotation were set as the limit. Surgical treatment was a multi-operator process, and the operators comprised four orthopedic surgeons of the service.

Surgery involved either isolated osteosynthesis or revision arthroplasty associated with osteosynthesis. The different osteosynthesis were as follows: Osteosynthesis by strapping, by Dall–Miles cables type plate, by screw plate locked with LCP, or femoral plates LCP with hook. The change of prosthesis consisted of changing the stem with another with a longer femoral stem. The aim was to find an area in the distal femur that was capable of holding the implant and then to fix the fractured fragments upon it. According to the type of fracture, sealing of the implant, and the characteristics of patients, the decision of PF treatment was dependent on the Vancouver

Type:

- Vancouver Type A fractures: Orthopedic treatment unless very significant displacement was present.

- Vancouver Type B fractures: • Fracture B1: Osteosynthesis • Fracture B2 and B3: Change of stem or not, andosteosynthesis if necessary.

- Vancouver Type C: Osteosynthesis.

The Vancouver classification facilitated treatment decisions, and the results were observed with a mean follow-up of 12 months

Results

During the study period, 616 patients were hospitalized in the orthopedic surgery trauma department, of which 102 were for femoral fracture, including 22 for femoral fracture on hip arthroplasty (HP). Of the 22 patients treated for PF, there were 8 men and 14 women with a sex ratio of 0.57. The average age of patients was 81.86 years with extremes of 46 and 97 years. In the 22 patients, there was 1 case of intraoperative fracture iatrogenic and 21 cases of PF. We classified fractures according to the Vancouver classification **(**Table 1**)**. The results

according to the treatment of the different fractures are recorded in **(**Table 2**)**. The results were observed with a mean follow-up of 12 months (extremes 6 and 18 months) as shown in Figures 1,2,3 and 4. In the 22 patients treated forPF, 2 died, 1 as a result of decompensation of the defects, and the other, of a postoperative pulmonary embolism. In total, 18 patients consolidated, 1 patient had a non-union and 1 had a new fracture on the same bone. In these consolidated patients, 2 had a shortenings of 3 and 7 mm and 1 had consolidated in external rotation of 15°.

A			B			C
	AG	AL	B1	B2	B3	C
EFFECTIVE	2	0	10	2	5	3
PERCENTAGE	9,1	0	45.5	9.1	22.7	13,6

Table 1: Different types of fracture according to the Vancouver classification

PRIMARY	IHA	THA	TOTAL
	7	14	21
REVISION	0	1	1
TOTAL	7	16	22

Table 2: Different types of prosthesis

	A	B1	B2	B3	C
Conservative treatment	1	2	1	1	
Change of the stem				4	
Conservation of the stem	1	8	1		3
LCP				3	3
Hook LCP	1	3	1	1	
Dall–miles cables		1			

Table 3: Different types of treatment according to the Vancouver classification

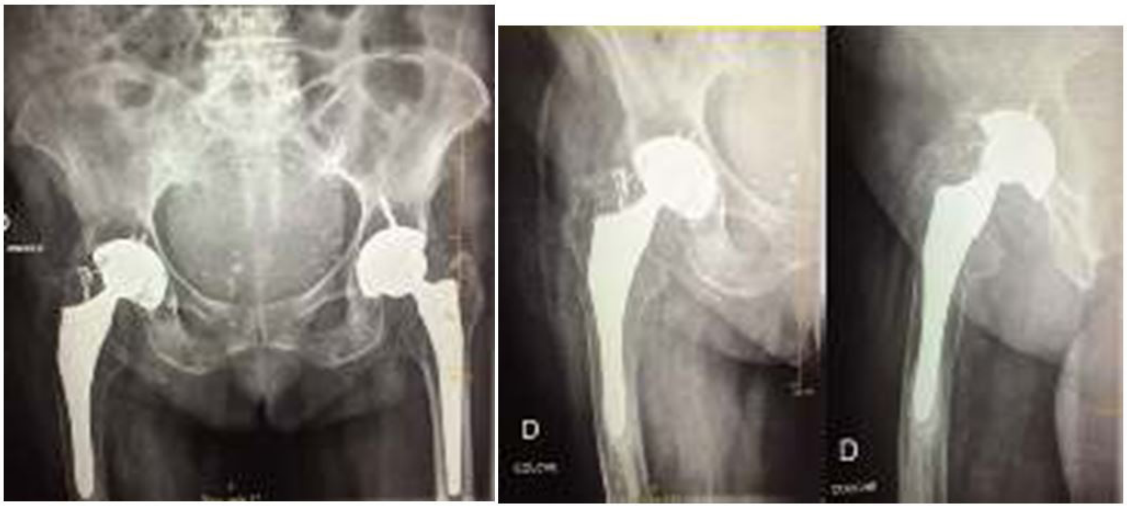


Figure 1: Type B1 treated with a non-operative method

Figure 2: Type B2 treated with an LCP crochet plate + Dall–Miles bond beaded cable

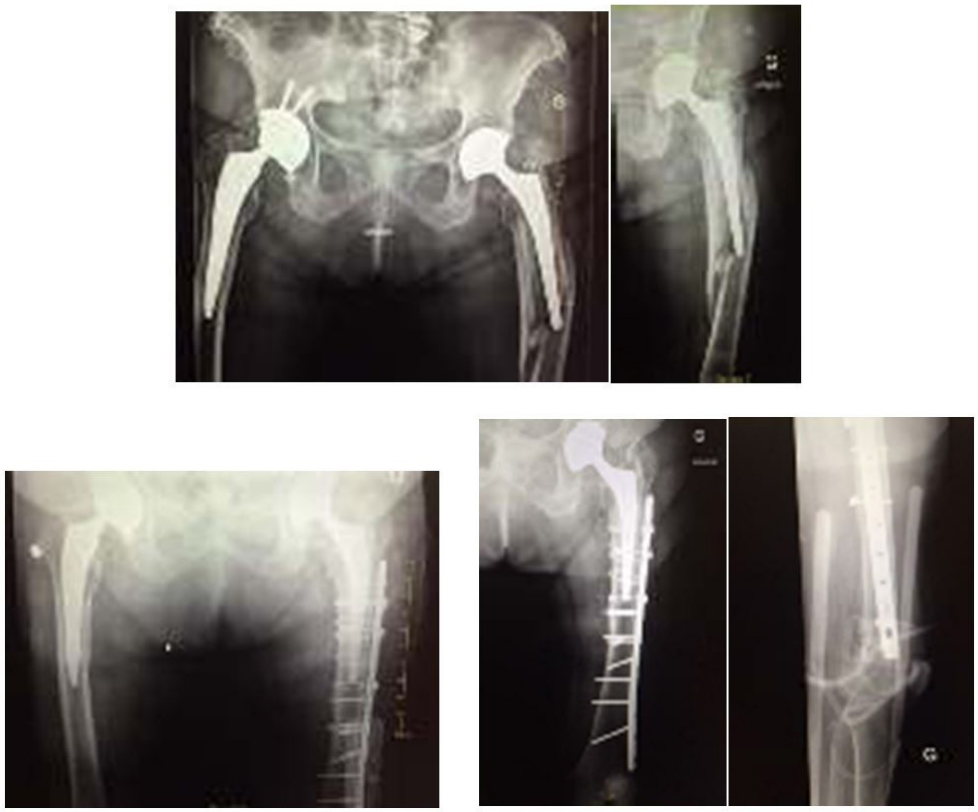


Figure 3: Fracture type B3 osteosynthesis with a long LCP plate + Dall–Miles bond

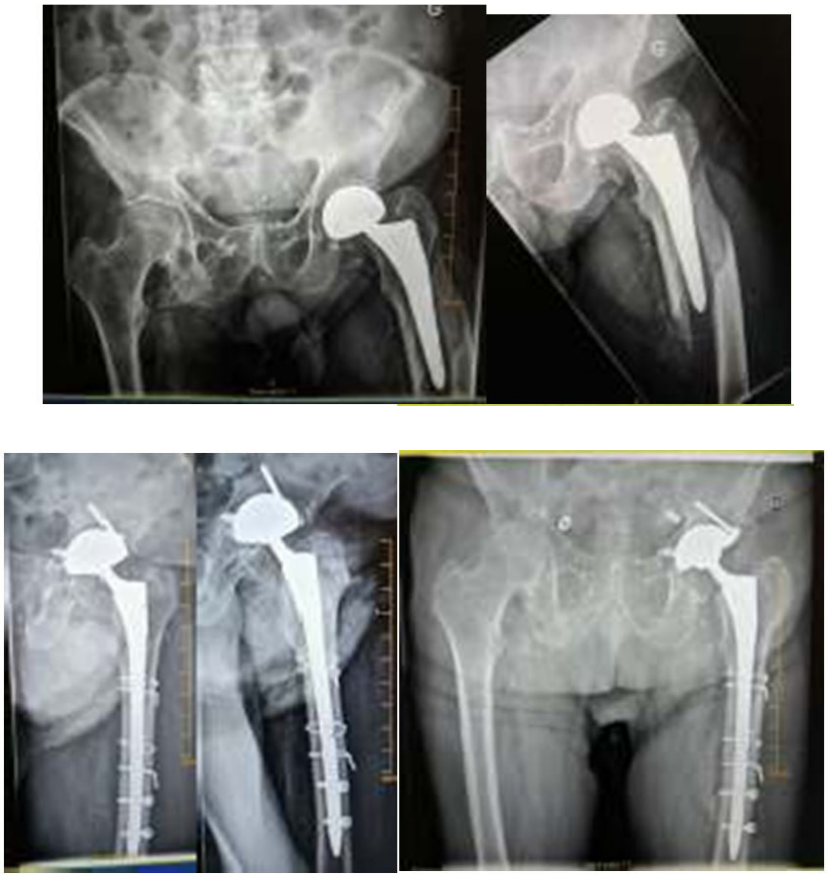


Figure 4: Type B3 treated with a prosthesis change (locked prosthesis) added to the bond

Discussion

In total, 18 patients consolidated, 1 patient had non-union, and 1 had a new fracture on the same bone. The current study population is similar to that of the study by Ben-Aissi [7], even if the study period is longer at 5 years, while the study by Karabila is over an even longer period of 8 years [8]; however, the study by Holley extends beyonda period of 17 years [9]. The average age in the current study was 81.86 years (extremes, 46 and 97 years), while Katzfound an average age of 82.5 years in the United States [10], and Ehlinger (France) found an average age of 76 years [11]. Moreover, Ben-Aissi (Morocco) found an average age of 68 years, and Karabila (Morocco) and average ageof 67 years [7,8]. This relatively high average age in Western countries is mainly due to the aging of the population and a very high life expectancy.

Several classifications exist for periprosthetic hip fractures [12,13]; most of these are descriptive, and while they provide information about the headquarters, they do not bring any significant interest information in the treatment. In the current study, we chose the Vancouver classification as described by Duncan because it is widely used [6] and takes into account the three most important criteria in the management of periprosthetic hip fractures: The fracture site, stability of the femoral implant, and the quality of the surrounding femoral bone stock. In addition to being simple and reproducible, the Vancouver classification is useful for developing a therapeutic strategy based on easily identifiable characteristics. Furthermore, the Vancouver classification allows the surgeon to differentiate a stable fracture from an unstable fracture that requires osteosynthesis, but also a stable implant from an unstable implant that requires revision [14]. The hemi arthroplasties, in the curent series, were consecutive to femoral neck fractures type 3 and 4 of Garden, whereas total arthroplasties were mostly performed for hip osteoarthritis. In the current study, a total of 17 fractures occurred on uncemented prostheses compared to 5 on cemented prostheses. In the literature, the prevalence of PF ranges from 0.1% to 1% for cemented prosthesis [15]. The iatrogenic fracture occurred in the current series during a revision surgery during the placement of the femoral stem and it's interested the greater trochanter. Iatrogenic fractures are described as occurring most frequently during the placement of the femoral stem [2,16,17], and this risk is increased by non-cemented stems. Indeed, the tapered shape of the cementless stems associated with the impaction force during their placement favors the occurrence of these iatrogenic fractures [14,18]. Careful grating of the medullary canal during surgery minimizes intraoperative or postoperative fractures [19]. According to Schmidt, intraoperative fluoroscopy can also be used to reduce the possibility of unrecognized cortical perforation [18]. In this series, we found two fractures of the greater trochanter type A by the Vancouver classification. An unmoved bill received a non-operative treatment, and the second, corresponding to the iatrogenic intraoperative fracture, was osteosynthesis by an LCPhook plate and Dall–Miles cables. These fractures are generally stable due to the action of the vast lateral and gluteal muscles. The treatment of these non-displaced fractures is non operative and consists of bed rest for 6 to 12 weeks with eviction of hip abduction until the fracture heals [20]. When moved, they require a fixation, either with a cable reconstruction hook plate or strapping, to restore the functional lever of the gluteal muscles [21]. In the10 patients with a Vancouver type B1 fracture, 2 had a non-operative treatment and 8 had an open reduction and an internal fixation without stem changes; used alone or in a combination of strapping and LCP plates. This treatment is robust and appears to be superior to what is generally accepted in these type of fractures since DCP plates are used in the majority of cases [13,22-24]. The use of LCP plates provides greater stability, especially for patients with osteoporotic bones. However, several studies have shown that strapping alone has a high failure rate, and that the use of proximal unicortical screws on DCP plates is more stable than strapping alone [18,25-29]. In the current study, 2 patients had Vancouver type B2 fractures, 1 of whom was operated with LCP hook reconstruction plate osteosynthesis with wire strapping and Dall–Miles cables. Revision arthroplasty is the treatment of choice for this lesion [21,30,31], and the main decisions revolve around the length of the femoral stem, use of a cemented or non-cemented stem, strapping wires or plaque for fracture reduction, and whether bone grafting is needed to increase stability. In the current study, 5 patients had Vancouver type B3 fractures, of which 4 patients had a change of prosthesis, including 1 that was cemented; in the literature, revision arthroplasty is the treatment of choice for this lesion [21,32]. The 3 patients with Vancouver Type C fractures were operated with a PCL femoral plate and a Dall–Miles cables, which is the treatment of choice for these types of fractures. In total, 2 patients died, which resulted in a 9.1% mortality rate, and 1 case of refracture gave a 4.54% refracture rate. The study by

Young had a 7.3% mortality rate and a 7.3% refracture rate at 6 months.[33] In the current study, the 3 patients with sequelae were all treated orthopedically, thus justifying the superiority of the surgical treatment whenever the general condition of the patient and the quality of the bone allow it.

Conclusion

The cumulative growth of periprosthetic fracture is an indication of the increasing number of hip arthroplasties in relation to the high life expectancy of the population. Age, osteoporosis, use of uncemented stems, and revision of prosthesis are the main risk factors for the occurrence of these fractures, which happen according to two mechanisms: Iatrogenic intraoperative fractures and postoperative traumatic fractures. Management of PF represents a real challenge for the orthopedic surgeon and must take into account the sealed or unsealed nature of the prosthesis, quality of the bone capital, and the patient's general condition related to comorbidities. The results are generally satisfactory with consolidation in almost all cases and very few sequelae.

Notes

The authors grant exclusive license to publish the material in Sage Publications, on acceptance for publication.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

1. Kurtz S (2007) Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. J Bone Jt Surg Am 89: 780.

2. Lindahl H (2007) Epidemiology of periprosthetic femur fracture around a total hip arthroplasty. Injury 38: 651-4.

3. Cassidy JT, Baker JF, Keogh P, Kenny P (2015) Periprosthetic fractures about the hip: a case-matched retrospective analysis of functional outcomes postrehabilitation. Geriatr Orthop Surg Rehabil 6: 147-52.

4. Capone A, Congia S, Civinini R, Marongiu G (2017) Periprosthetic fractures: epidemiology and current treatment. Clin Cases Miner Bone Metab 14: 189-96.

5. Phillips JRA, Boulton C, Morac CG, Manktelov ARJ (2011) What is the financial cost of treating periprosthetic hip fractures? Injury 42: 146-9.

6. Duncan CP, Masri BA (1995) Fractures of the femur after hip replacement. Instr Course Lect 44: 293-304.

7. Ben-aissi M, Hani R, Otmani LE (2017) Management of periprosthetic femoral fractures: about 12 cases. Sch J App Med Sci 5: 4371-2.

8. Karabila MA, Mhamdi Y, Azouz M (2016) Femoral periprosthetic hip fractures: a retrospective study of 15 cases [Les fractures péri-prothétiques fémorales de la hanche: étude rétrospective à propos de 15 cas]. Pan Afr Med J 23: 10.11604/pamj.2016.23.177.8612.

9. Holley K, Zelken J, Padgett D, Chimento G, Yun A, et al. (2007) Periprosthetic fractures of the femur after hip arthroplasty: an analysis of 99 patients. HSS J 3: 190-7.

10. Katz JN, Wright EA, Polaris JJ, Harris MB, Losina E (2014) Prevalence and risk factors for periprosthetic fracture in older recipients of total hip replacement: a cohort study. BMC Musculoskelet Disord 15: 168.

11. Ehlinger M, Adam P, Di Marco A, Arlettaz Y, Moor B-K, et al. (2011) Periprosthetic femoral fractures treated by locked plating: feasibility assessment of the mini-invasive surgical option. A prospective series of 36 fractures. Orthop Traumatol Surg Res OTSR 97: 622-8.

12. Beals RK, Tower SS (1996) Periprosthetic fractures of the femur. An analysis of 93 fractures. Clin Orthop 327: 238-46.

13. Bethea JS, DeAndrade JR, Fleming LL, Lindenbaum SD, Welch RB (1982) Proximal femoral fractures following total hip arthroplasty. Clin Orthop 170: 95-106.

14. Stuchin SA (1990) Femoral shaft fracture in porous and press-fit total hip arthroplasty. Orthop Rev 19: 153-9.

15. Kavanagh BF (1992) Femoral fractures associated with total hip arthroplasty. Orthop Clin North Am 23: 249-57.

16. Berry DJ (1999) Epidemiology: hip and knee. Orthop Clin North Am 30: 183-90.

17. Berry DJ (2002) Management of periprosthetic fractures: the hip. J Arthroplasty 17: 11-3.

18. Schmidt AH, Kyle RF (2002) Periprosthetic fractures of the femur. Orthop Clin North Am 33: 143-52.

19. Duwelius PJ, Schmidt AH, Kyle RF, Talbott V, Ellis TJ, et al. (2004) A prospective, modernized treatment protocol for periprosthetic femur fractures. Orthop Clin North Am 35: 485-92.

20. Pritchett JW (2001) Fracture of the greater trochanter after hip replacement. Clin Orthop 390: 221-6.

21. Schwarzkopf R, Oni JK, Marwin SE (2013) Total hip arthroplasty periprosthetic femoral fractures: a review of classification and current treatment. Bull Hosp Jt Dis 71: 68-78.

22. Garbuz DS, Masri BA, Duncan CP (1998) Periprosthetic fractures of the femur: principles of prevention and management. Instr Course Lect 47: 237-42.

23. Partridge AJ, Evans PE (1982) The treatment of fractions of the shaft of the femur using nylon cerclage. J Bone Joint Surg Br 64: 210-4.

24. Tsiridis E, Narvani AA, Timperley JA, Gie GA (2005) Dynamic compression plates for Vancouver type B periprosthetic femoral fractures. Acta Orthop 76: 531-7.

25. Dennis MG, Simon JA, Kummer FJ, Koval KJ, DiCesare PE (2000) Fixation of periprosthetic femoral shaft fractures occurring at the tip of the stem: a biomechanical study of 5 techniques. J Arthroplasty 15: 523-8.

26. Agarwal S, Andrews CM, Bakeer GM (2005) Outcome following stabilization of type B1 periprosthetic femoral fractures. J Arthroplasty 20: 118-21.

27. Ahuja S, Chatterji S (2002) The Mennen femoral plate for fixation of periprosthetic femoral fractures following hip arthroplasty. Injury 33: 47-50.

28. Parvizi J, Rapuri V, Purtill J, Sharkey P, Rothman R, et al. (2004) Treatment protocol for proximal femoral periprosthetic fractures. J Bone Jt Surg 86: 8-16.

29. Petersen VS (1998) Problems with the Mennen plate when used for femoral fractures associated with implants. Int Orthop 22: 169-70.

30. Lewallen DG, Berry DJ (1998) Periprosthetic fracture of the femur after total hip arthroplasty: treatment and results to date. Instr Course Lect 47: 243-9.

31. Larson JE, Chao EY, Fitzgerald RH (1991) Bypassing femoral cortical defects with cemented intramedullary stems. J Orthop Res Off Publ Orthop Res Soc 9: 414-21.

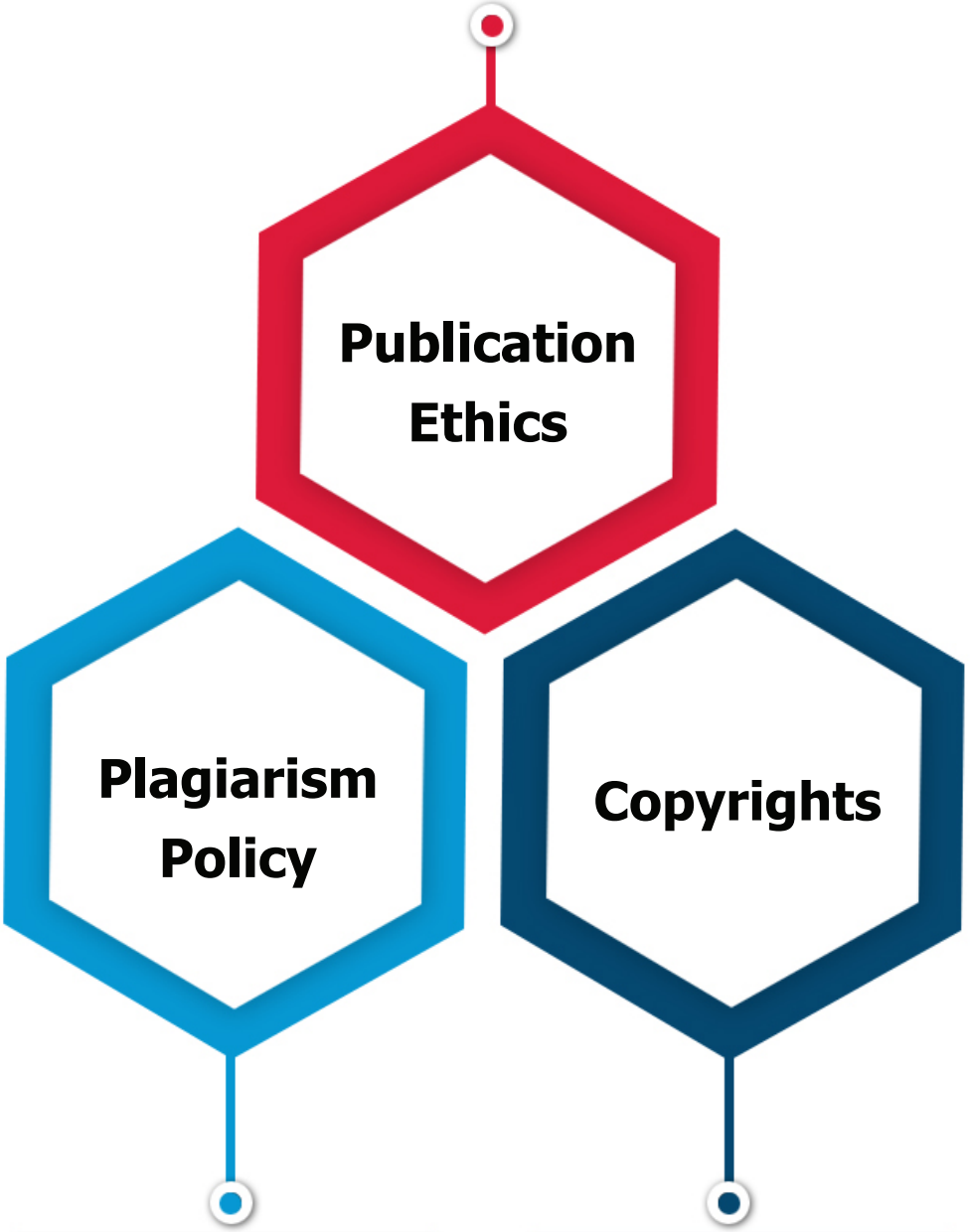
32. Barden B, von Knoch M, Fitzek JG, Löer F (2003) Periprosthetic fractures with extensive bone loss treated with onlay strut allografts. Int Orthop 27: 164-7.

33. Young SW, Walker CG, Pitto RP (2008) Functional outcome of femoral peri prosthetic fracture and revision hip arthroplasty: a matched-pair study from the New Zealand Registry. Acta Orthop 79: 483-8.

CEOS CENTER OF EXCELLENCE FOR OPEN SCIENCE

CEOS is an growing Open Access Publisher with diverse peer reviewed journals supported by Aca demic Editors, Scholars, Physicians, Instructors,

CEOS Publishers follow strict ethical standards for publication to ensure high quality scientific studies, credit for the research participants. Any ethical issues will be scrutinized carefully to maintain the integrity of literature.



DISSCI Publisher journals are inviting manuscript submissions and currently accepting original research articles, review articles, clinical reports, case studies, short communications, pers -pective, and commentaries.

Now submitting a manuscript is quick and easy. Submit your manuscript to: submissions@dissci.com

DISSCI Publisher journals are inviting manuscript submissions and currently accepting original research articles, review articles, clinical reports, case studies, short communications, pers -pective, and commentaries.

Now submitting a manuscript is quick and easy. Submit your manuscript to: submissions@dissci.com