

The Outcome of Bicolunar Acetabular Fracture Treated by Single Anterior Ilioinguinal Approach

Muhammad Naeem Hassan¹, Muhammad Umair Abbas², Hafiz M. Umar², Shuja Uddin², Zaigham Habib³, S. Rizwan UI Haq⁴, Ahmed Umair Asad Khan²

¹Department of Orthopedic Surgery, Al Rehmat Trust Hospital, Pasrur, ²Department of Orthopedic Surgery, Lahore General Hospital, Lahore, ³Department of Orthopedic Surgery, Tehsil Headquarter Hospital (THQ), Ferozwala,

⁴Department of Orthopedic Surgery, Tehsil Headquarter Hospital (THQ), Khanewal, Punjab, Pakistan.

ABSTRACT

Background: Acetabular fracture therapy, being complicated, is generally treated by non-operative methods due to a lack of surgeons' expertise in pelvis surgery. The surgical exposure and reduction of acetabular fractures may become more direct and practical with the altered technique since it is closer to the acetabular quadrilateral plate. This study aimed to determine the efficacy of a single anterior ilio-inguinal approach for the management of a Bi-columnar acetabulum fracture.

Methods: Sixty patients, fulfilling the selection criteria were selected for descriptive case series from Orthopedic Surgery Department at Lahore General Hospital, from 02-12-2020 to 02-06-2021. After informed consent, surgery was performed on all patients under general anesthesia. Patients were followed-up and evaluated for efficacy in OPD after 12 weeks of surgery with a Harris hip score. All demographic and other information was recorded on a Proforma. SPSS 22 was used to assess data. Post-stratification, efficacy was compared by using chi-square, p -value ≤ 0.05 was considered significant.

Results: Out of 60 patients, 45(75 %) were male, whereas 15(25%) were female (Mean age 52.71 ± 10.50 yrs). The Mean of duration fracture (in days) and Harris score are 11.03 ± 5.29 and 2.83 ± 0.45 respectively. The efficacy concerning lateral side was 60% for left side and 26.7% for right side. Efficacy was higher in less than 10 days old fractures at 55.0% while after 10 days it was 31.7%. We found that the percentage of efficacy was 86.7%.

Conclusion: The current study concluded that the anterior ilio-inguinal approach is highly effective ($p=0.001$) in the management of acetabular fractures.

Keywords: Acetabulum; Pelvic; Fracture; General Surgery.

Corresponding author:

Dr. Shuja Uddin

Department of Orthopedic Surgery,
Lahore General Hospital,
Lahore, Pakistan.

Email: drshujauddin111@gmail.com

ORCID ID: 0000-0003-2734-4834

DOI: <https://doi.org/10.36283/PJMD12-1/004>

How to cite: Hassan MN, Abbas MU, Umar HM, Uddin S, Habib Z, Haq SRU, et al. The Outcome of Bicolunar Acetabular Fracture Treated by Single Anterior Ilioinguinal Approach. Pak J Med Dent. 2023;12(1): 12-17. doi: 10.36283/PJMD12-1/004

This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY) 4.0
<https://creativecommons.org/licenses/by/4.0/>

INTRODUCTION

Despite being relatively rare, acetabulum fractures are associated with high morbidity and death¹. These involve high-intensity trauma, and due to their complexity, care calls for comprehension of the pertinent surgical anatomy, proper radiographic assessment of the injury, and choosing the most appropriate action plan². Adult pelvic fractures account for 3-6% of all fractures and up to 20% of polytrauma patients. Men sustain about 75% of all pelvic injuries. With obese patients, the risk of blunt trauma-related pelvic fracture rises³.

With the increased use of automobiles in recent years, it has been rising⁴. Post-traumatic hip osteoarthritis is one of the most significant side effects of acetabular fracture; it has been linked to poor fracture reduction, the kind of fracture, and delays in the reduction and fixation of acetabular fracture (surgery timing)⁵. Patients who suffer from acetabular fractures and who are elderly represent the fastest-growing and most challenging-to-treat population⁶. Extrapelvic constructs can be utilized alone or in conjunction with intrapelvic-extrapelvic constructs during surgical treatment⁷. The question of which fixation offers the fracture more stability during osteosynthesis of the bicolumnar fracture arises⁸.

Acetabular fractures are internally fixed using the ilioinguinal technique. Although the results of this technique have received extensive reporting, information on potential side effects is sparse⁹. The impact on the iliopsoas muscle in particular, whose iliac attachments are virtually entirely freed, has not been well assessed¹⁰. Chen et al. reported that a single anterior ilioinguinal approach had an efficacy of 95.5% (>80 Harris hip score) for the management of Bi-columnar acetabulum fracture¹¹. While Gupta et al. reported in a study that a single anterior ilioinguinal approach had an efficacy of 81.8% (>80 Harris hip score) for the management of Bi-columnar acetabulum fracture¹².

The rationale of this study was to determine the efficacy of a single anterior ilioinguinal approach for the management of bi-columnar acetabulum fracture. Through literature, it has been observed that the anterior ilioinguinal approach is highly effective in the management of acetabular fractures but not much work has been done in this regard. In routine, the posterior approach is used, but it is associated with many complications. This may be due to a lack of local evidence and that is why we want to conduct this study. Instead, the anterior ilioinguinal approach is found to be effective in >80% of cases. Therefore, to obtain local data that can be implemented in a local setting in the future with an anterior ilioinguinal approach for the management of bi-columnar acetabulum fracture and improve the patient's outcome. This study aimed to determine the efficacy of a single anterior ilioinguinal approach for the management of bio-columnar acetabulum fracture.

METHODS

This was a descriptive case series conducted at the Department of Orthopedics Surgery, Lahore General Hospital, Lahore conducted from December 2020 to June 2021. A sample size of 60 cases is calculated with a 95% confidence level, 10% margin of error, and taking an expected percentage of efficacy i.e., 81.8% with a single anterior ilioinguinal approach for the management of Bi-columnar acetabulum fracture¹⁰. Sample selection was done with the help of non-probability consecutive sampling. To choose the sample, predetermined inclusion and exclusion criteria were developed. The study comprised patients between the ages of 40 and 80 who presented with a bicolumnar acetabulum fracture (as per the operational definition). The following patients were excluded from the study. i.e., bilateral cases, ASA III and IV, diabetes (BSR>20mg/dl), infection at fracture site (x-rays), chronic case (i.e., h/o >7 days of fracture), osteoporosis (BMD< -1.0 on DEXA).

Patients (n=60) who met the inclusion and exclusion criteria were chosen from the emergency room of the orthopedic department at Lahore General Hospital in Lahore after receiving approval from the hospital ethics council. Written consent was obtained. Name, age, gender, laterality, cause, and length of fracture were noted along with other demographic data. A single surgical team operated on all the patients while the patients were all under general anesthesia, with the help of the researcher. The patient was placed on a flat, radiolucent operating table in the supine position. The three markers for the incision were the symphysis pubis, anterior superior iliac spine, and navel, which together formed a triangle. The 10 cm incision began at the intersection of the middle and medial third of the line linking the ipsilateral anterior superior iliac spine with the navel and concluded at the intersection of the middle and lateral third of the line. Patients were moved into post-surgical wards when the reduction was completed. When patients could walk with a stick or stand unassisted, they were then released from the hospital. After 12 weeks following surgery, patients were checked on in the OPD. Patients were evaluated for Harris Hip Score. If a hip score >80 was achieved within 12 weeks, then efficacy was labeled (as per the operational definition). A Proforma was used by the researcher to calculate all the data.

SPSS 22 was used to enter and evaluate the data. quantitative information such as age and fracture duration. Harris Hip Score was presented by Mean±SD. Qualitative data like gender, lateral side, cause of fracture and efficacy was presented by frequency and percentages. Data was stratified for age, gender, lateral side, duration and cause of fracture to control effect modifiers. Post-stratification, efficacy was compared by using the chi-square test for stratified groups keeping p-value ≤0.05 as significant.

RESULTS

After 60 patients fulfilling inclusion and exclusion

criteria were selected to determine the efficacy (>80 Harris score) of a single anterior ilioinguinal approach for the management of Bi-columnar acetabulum fracture. The patient was subjected to a postoperative

x-ray. Depending on the associated injury and patient stability, mobilization with physical therapy on the bed was starting on post-op day one (Figure 1 A,B).

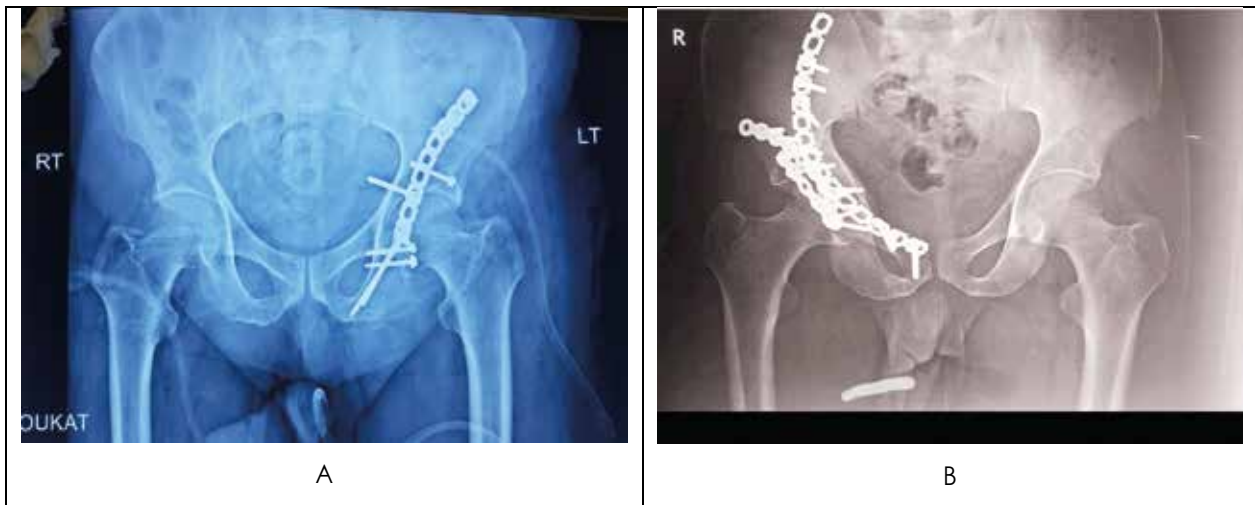


Figure 1 (A,B): Postoperative radiographs of the patient's hip with pelvis.

Age distribution of the patients shows that out of 60 patients, 49(81.7%) were in the age group of 40-60 years and 11(18.3%) were in the age group of 61-80

and the mean age was calculated as 52.71±10.50 years (Table 1).

Table 1: Patients' characteristics of the study.

Age n (%)	40-60 Years	61-80 Years	Mean±SD
	49(81.7%)	11(18.3%)	52.71±10.50
Gender n (%)	Male	Female	
	45(75%)	15(25%)	
Duration of Fracture (Mean±SD)			11.03±5.29
Hip Harris Score (Mean±SD)			2.83±0.45
Lateral Side n (%)	Left	Right	
	36(60%)	24(40%)	
Causes n (%)	Fall	Road traffic accident (RTA)	Other
	46(76.7%)	10(16.7%)	4(6.7%)
Efficacy n (%)	Yes	No	
	52(86.7%)	8(13.3%)	

Gender distribution of the patients was done, it showed that 45(75%) were male whereas 15(25%)

were females. The percentage of efficacy was 86.7% (Figure 2).

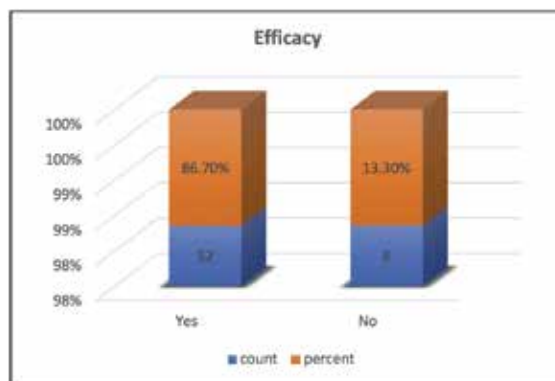


Figure 2: Representing the efficacy percentages of patients.

The distribution of duration of fracture and Harris Hip score show 11.03 ± 5.29 and 2.83 ± 0.45 respectively (Figure 3). The efficacy with respect to the lateral side is 60% for the left side and 26.7% for the right side. Efficacy was higher in less than 10 days old

fractures as 55.0% while in more than 10 days old fractures it is 31.7%. We found that the Percentage of efficacy was 86.7%. The data was stratified for age, gender, lateral side, duration and cause of fracture shown in Table 2.

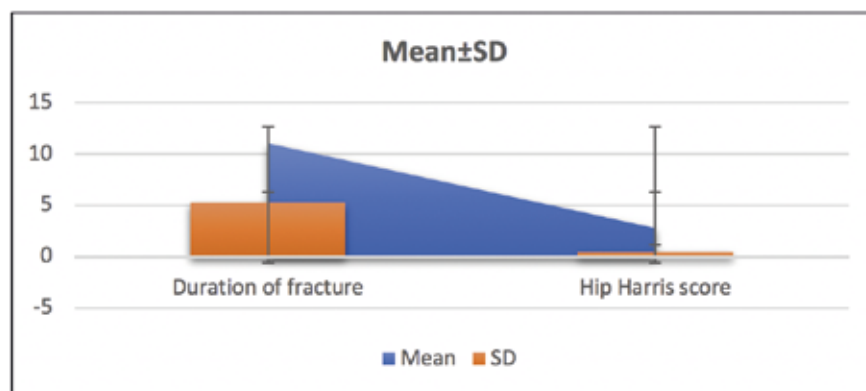


Figure 3: Mean of the duration of fracture and Hip Harris Hip score.

Table 2: Efficacy of treatment concerning patients' characteristics.

Variables	Categories	Efficacy		p-Value
		Yes	No	
		n=52	n=8	
Age	40-60 Years	44 (73.3%)	5 (8.3%)	0.132
	61-80 Years	8 (13.3%)	3 (5.0%)	
Gender	Male	40 (66.7%)	5 (8.3%)	0.380
	Female	12 (20%)	3 (5%)	
Lateral Side	Left	36(60%)	0(0%)	0.001
	Right	16(26.7%)	8(13.3%)	
Cause	Fall	41(68.3%)	5(8.3%)	0.578
	RTA	8(13.3%)	2(3.3%)	
	Other	3(5%)	1(1.7%)	
Duration	≤10 Days	33(55%)	0(0%)	0.001
	>10 Days	19(31.7%)	8(13.3%)	

DISCUSSION

Acetabulum fractures typically occur in young adults as a result of high-velocity injuries (e.g., high-speed vehicle or falls on the floor from height); they are frequently linked to other potentially fatal injuries. The hip joint develops articular incongruity as a result of the fracture pieces being displaced, which causes aberrant pressure to be distributed on the articular cartilage surface. This may cause the cartilage surface to rapidly deteriorate, which can cause crippling hip joint arthritis. One of the most complicated injuries that orthopedic surgeons treat is acetabular fractures. Our grasp of surgical procedures, reduction strategies, problems, and outcomes were introduced by Gupta and Ziran's work^{12,13}. After 20 years, up to 80% of acetabular fractures that had surgery reported good to outstanding functional outcomes^{14,15}.

The clinical prognosis of an acetabular fracture may be influenced by a variety of variables, including pre-existing disorders, injury-related factors, surgical concerns, and postoperative sequelae. Clinical success has been demonstrated to be highly dependent on the quality of the articular reduction^{15,16}. Case reports of the surgical fixation of acetabular fractures were the first results to be published. A study used plates and screws to treat an acetabular fracture into the inner side of the ilium 1943. In 1949, the anterior iliofemoral technique for surgically stabilizing an acetabular fracture was described¹³.

In the current study, the age distribution of the patients was done, and it shows that out of 60 patients, 49(81.7 %) were in the age group of 40-60 years and 11(18.3%) were in the age group of 61-80

and mean age was calculated as 52.71 ± 10.50 years. There were 75%(45) were male whereas 25%(15) were females. In this study, we determined the efficacy of a single anterior ilioinguinal approach for the management of bi-columnar acetabulum fracture and we found that the percentage of efficacy was 86.7%. Another study reported that a single anterior ilioinguinal approach had an efficacy of 95.5% (>80 Harris hip score) for the management of bi-columnar acetabulum fracture¹¹. Gupta et al. reported in a study that a single anterior ilioinguinal approach had an efficacy of 81.8% (>80 Harris Hip Score) for the management of bi-columnar acetabulum fracture¹².

The "gold standard" for treating displaced acetabular fractures for the past 40 years has been surgery. A virtually perfect open reduction and internal fixation can significantly lower fracture complications and improve clinical outcomes for patients¹⁷. However, for acetabular fracture surgery, picking the right strategy is essential. previously, the majority of acetabular anterior column and anterior wall fracture cases were successfully treated with the typical ilioinguinal. A second incision exposing a lateral window along the iliac crest is utilized to enable reduction and fixation in fractures with a high anterior column component (exiting the iliac crest) or those needing posterior column lag screws.

Patients were classified based on BMI in a retrospective examination of 169 consecutive surgically repaired acetabular fractures to determine postoperative complications¹⁸. The results showed that the participants with a BMI of 30 or higher had a 2.1-fold increased risk of estimated blood loss of more than 750 cc and a 2.6-fold increased risk of deep vein thrombosis, while those with a BMI of 40 or higher had a 5-fold increased risk of wound infection. Obese patients occasionally require surgical treatment, but we can use this knowledge to educate patients about their elevated risk of problems and look into ways to reduce them¹⁹.

In a retrospective analysis of 53 patients with surgically treated acetabular fractures who were followed for two years, age, fracture complexity, and injury to the head of femurs were statically meaningful markers of poor outcome². Patients under the age of 40 had a better prognosis than those who were older. The authors believe that osteoporosis, which makes surgical reduction and fixation difficult, is a contributing factor in older patients' inferior outcomes. A bigger trial by Matta, which also included 262 fractures followed for a minimum of two years revealed that age is an independent risk factor for clinical prognosis. Only 68% of patients 40 years of age or older showed a G-E result compared to 81% of patients under the age of 40. In a more recent investigation, it was

determined what characteristics in individuals above the age of 55 affected radiographic and clinical outcomes²⁰.

In a dataset consisting, Carroll et al. found that 50% of patients had concomitant injuries: 35% had lower extremity injuries, which were most common, 19% had chest injuries, 18% had head injuries, 13% had nerve palsies, 8% had abdomen injuries, 6% had genitourinary injuries, and 4% had spine injuries²¹. As many as 35% of isolated acetabular fractures necessitate blood transfusions, according to one research²². Upon admission, the sciatic nerve injury must also be examined. The peroneal division of the sciatic nerve is usually invariably injured, though less frequently the tibial division is as well. A foot drop will occur if the peroneal nerve division of the sciatic nerve is injured^{23,24}. The surgical exposure and reduction of acetabular fractures may become more straightforward and practical with the improved method because it was closer to the acetabular quadrilateral plate^{11,25}.

CONCLUSION

The current study determined the efficacy of a single anterior ilioinguinal approach for the management of bi-columnar acetabulum fracture. The percentage of efficacy was 86.7%. Therefore, it is concluded that the use of the single anterior ilioinguinal approach for the treatment of acetabular fractures provides an excellent result. Furthermore, there were fewer complications, thus the single anterior ilioinguinal approach might be a preferable choice for the treatment of bicolumnar acetabular fracture.

ACKNOWLEDGEMENTS

The authors appreciate the cooperation of their professors and senior colleagues for their guidance.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

ETHICS APPROVAL

The ethics certificate was issued from the Head of the Department, Orthopedic Surgery, LGH Lahore (35/11/ortho/LGH).

PATIENT CONSENT

Informed consent was taken from all the patients.

AUTHORS' CONTRIBUTION

NH proposed the idea of the study, made a questionnaire, and did surgical work. SU did data entry and analysis. SRH corrected plagiarism, and AUA made the tables and figures.

REFERENCES

1. Kandasamy MS, Duraisamy M, Ganeshsankar K, Kurup VG, Radhakrishnan S. Acetabular fractures: an analysis on clinical outcomes of surgical treat-

- ment. *Int J Res Orthop*. 2017;3(1):122-126. doi: 10.18203/issn.2455-4510.IntJResOrthop20164836
2. Jindal K, Aggarwal S, Kumar P, Kumar V. Complications in patients of acetabular fractures and the factors affecting the quality of reduction in surgically treated cases. *J Clin Orthop Trauma*. 2019;10(5):884-889. doi: 10.1016/j.jcot.2019.02.012
 3. Mardanpour K, Rahbar M, Rahbar M, Mardanpour N, Mardanpour S. Functional outcomes of traumatic complex acetabulum fractures with open reduction and internal fixation: 200 cases. *Open J Orthop*. 2016;6(12):363-377. doi: 10.4236/ojo.2016.612049
 4. Hirvensalo E, Lindahl J, Kiljunen V. Modified and new approaches for pelvic and acetabular surgery. *Injury*. 2007;38(4):431-441. doi: 10.1016/j.injury.2007.01.020
 5. Cahueque M, Marfinez M, Cobar A, Bregni M. Early reduction of acetabular fractures decreases the risk of post-traumatic hip osteoarthritis? *J Clin Orthop Trauma*. 2017;8(4):320-326. doi: 10.1016/j.jcot.2017.01.001
 6. Moed BR, McMichael JC. Outcomes of posterior wall fractures of the acetabulum. *J Bone Joint Surg*. 2007;89(6):1170-1176. doi: 10.2106/JBJS.F.00473
 7. Gillispie GJ, Babcock SN, McNamara KP, Dimoff ME, Aneja A, Brown PJ, et al. Biomechanical comparison of intrapelvic and extrapelvic fixation for acetabular fractures involving the quadrilateral plate. *J Orthop Trauma*. 2017;31(11):570-576. doi: 10.1097/BOT.0000000000000963
 8. Bodzay T, Sztrinkai G, Kocsis A, Kozma B, Gál T, Váradi K. Comparison of different fixation methods of bicolunar acetabular fractures. *Jt Dis Relat Surg*. 2018;29(1):2-7. doi: 10.5606/ehc.2018.59268
 9. Perdue Jr PW, Tainter D, Toney C, Lee C. Evaluation and management of posterior wall acetabulum fractures. *J Am Acad Orthop Surg*. 2021;29(21):1-11. doi: 10.5435/JAAOS-D-20-01301
 10. Lao A, Putman S, Soenen M, Migaud H. The ilio-inguinal approach for recent acetabular fractures: ultrasound evaluation of the ilio-psoas muscle and complications in 24 consecutive patients. *Orthop Traumatol Surg Res*. 2014;100(4):375-378. doi: 10.1016/j.otsr.2014.02.006
 11. Chen K, Ji Y, Huang Z, Navinduth R, Yang F, Sun T, et al. Single modified ilioinguinal approach for the treatment of acetabular fractures involving both columns. *J Orthop Trauma*. 2018;32(11):428-434. doi: 10.1097/BOT.0000000000001303
 12. Gupta RK, Singh H, Dev B, Kansay R, Gupta P, Garg S. Results of operative treatment of acetabular fractures from the Third World—how local factors affect the outcome. *Int Orthop*. 2009;33(2):347-352. doi: 10.1007/s00264-007-0461-3
 13. Ziran N, Soles GL, Matta JM. Outcomes after surgical treatment of acetabular fractures: a review. *Patient Saf Surg*. 2019;13(1):1-9. doi: 10.1186/s13037-019-0196-2
 14. Letournel E. Acetabulum fractures: classification and management. *Clin Orthop Relat Res*. 2007;5(05):27-33. doi: 10.1055/s-2007-980136
 15. Tannast M, Najibi S, Matta JM. Two to twenty-year survivorship of the hip in 810 patients with operatively treated acetabular fractures. *J Bone Joint Surg*. 2012;94(17):1559-1567. doi: 10.2106/JBJS.K.00444
 16. Letournel E, Judet R. Fractures of the acetabulum. Springer Science & Business Media; 2012, pp. 23-28.
 17. Magu NK, Rohilla R, Arora S. Conservatively treated acetabular fractures: A retrospective analysis. *Indian J Orthop*. 2012;46(1):36-45. doi: 10.4103/0019-5413.91633
 18. Karunakar MA, Shah SN, Jerabek S. Body mass index as a predictor of complications after operative treatment of acetabular fractures. *J Bone Joint Surg*. 2005;87(7):1498-1502. doi: 10.2106/JBJS.D.02258
 19. Liebergall M, Mosheiff R, Low J, Goldvirt M, Matan Y, Segal D. Acetabular fractures: clinical outcome of surgical treatment. *Clin Orthop Relat Res*. 1999;366:205-216.
 20. Matta JM. Fracture of the acetabulum: accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury. *Orthop Trauma Direct*. 2011;9(2):31-36. doi: 10.1055/s-0030-1267077
 21. Carroll EA, Huber FG, Goldman AT, Virkus WW, Pagenkopf E, Lorch DG, et al. Treatment of acetabular fractures in an older population. *J Orthop Trauma*. 2010;24(10):637-644. doi: 10.1097/BOT.0b013e3181ceb685
 22. Magnussen RA, Tressler MA, Obremsky WT, Kregor PJ. Predicting blood loss in isolated pelvic and acetabular high-energy trauma. *J Orthop Trauma*. 2007;21(9):603-607. doi: 10.1097/BOT.0b013e3181599c27
 23. Fassler PR, Swiontkowski MF, Kilroy AW, Routt Jr ML. Injury of the sciatic nerve associated with acetabular fracture. *J Bone Joint Surg*. 1993;75(8):1157-1166.
 24. Hoge S, Chauvin BJ. Acetabular Fractures. [Updated 2020 Jun 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK544315/>
 25. Lubovsky O, Kreder M, Wright DA, Kiss A, Gallant A, Kreder HJ, et al. Quantitative measures of damage to subchondral bone are associated with functional outcome following treatment of displaced acetabular fracture. *J Orthop Res*. 2013;31(12):1980-1985. doi: 10.1002/jor.22458.