International Journal of Orthopaedics and Traumatology

ISSN Print: 2664-8318
ISSN Online: 2664-8326
Impact Factor: RJIF 5.42
IJOT 2024; 6(1): 83-89
www.orthopedicsjournal.in
Received: 03-08-2024
Accepted: 07-09-2024

Dr. Md. Maruf Al Hasan
Medical Officer, Department of Pediatric Orthopedic, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh

Dr. Sarwar Ibne Salam
Professor, Unit Chief, Department of Pediatric Orthopedic, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh

Dr. Biplab Mozumder
Registrar, Department of Orthopedics and Traumatology, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh

Dr. Muhammad Anwar Hossen
Assistant Professor (Ilizarov & Deformity correction). National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh

Dr. Md. Harunur Rashid
Jr.consultant, Department of Orthopedic, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh

Dr. Tapas Mandal
Assistant Registrar, Department of Pediatric Orthopedic, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh

Corresponding Author:
Dr. Md. Maruf Al Hasan
Medical Officer, Department of Pediatric Orthopedic, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh

A study on short term functional outcome of open osteochondroplasty for femoroacetabular impingement

Dr. Md. Maruf Al Hasan, Dr. Sarwar Ibne Salam, Dr. Biplab Mozumder, Dr. Muhammad Anwar Hossen, Dr. Md. Harunur Rashid and Dr. Tapas Mandal

DOI: https://doi.org/10.33545/26648318.2024.v6.i1b.47

Abstract
Background: Femoroacetabular impingement is one of the most common causes of hip pain in young, active individuals. It is characterized by abnormal contact between the femoral head and acetabulum. Open osteochondroplasty, which involves dislocating the hip to reshape the femoral head-neck junction and acetabular rim, remains vital in cases of complex deformities despite the advent of arthroscopic techniques. The study aimed at evaluating the short-term results of open osteochondroplasty in patients with symptomatic FAI, focusing on pain relief, functional improvement, ROM, and complications.
Methods: A retrospective analysis was performed on 31 patients who underwent open osteochondroplasty for FAI. Outcomes measures included VAS, HOS, WOMAC, iHOT-12, ROM, general health status by means of the EQ-5D Index and SF-12, and finally, postoperative complications.
Results: The results of the study were significantly improved. Pain was reduced by 58% from a VAS of 7.4 to 3.1 ($p<0.01$), Hip Outcome Score came to 44% (47.3–68.2, $p<0.01$), WOMAC: Symptomatic improvement in pain, stiffness, and physical function domains significantly improved by 53%, 52%, and 42%, respectively, with $p<0.01$, complication rate came to 4.2%, Significant improvement in flexion ROM by 15° ($p<0.01$) and internal rotation by 10° ($p<0.01$).
Conclusion: Open osteochondroplasty is a significant technique for decreasing pain and enhancing function and ROM in FAI patients; it is also associated with a rather low rate of complications. Therefore, this procedure remains a quite valuable option for the treatment of FAI, especially in complex cases.

Keywords: Femoroacetabular impingement, open osteochondroplasty, hip pain, hip function

Introduction
Femoroacetabular impingement is a common condition at the hip joint characterized between the abnormalities of the head of the femur and acetabulum. This abnormal contact can lead to pain, joint damage, and early-onset osteoarthritis (OA), hence lowering the life quality of affected individuals. An estimated 10-15% of adults in general are thought to be affected by FAI [16], with a greater frequency shown in athletes and those with particular hip joint morphology [17]. According to a review of the Danish Hip Arthroscopy Registry (DHAR), chondral damage was concurrent in up to 88% of patients with symptomatic FAI, primarily on the acetabular side [18]. FAI is categorized into three kinds according on the anatomical deformities: cam impingement, pincer impingement, and a combination of both [19]. Pincer impingement is defined as overgrowth of the acetabulum, whereas cam impingement is abnormality in the femoral head. The abnormal shape of the femoral head (cam) and the overgrowth of the acetabular rim (pincer) both contribute to joint damage in mixed impingement. In order to evaluate the epidemiology of FAI morphologies, Clohisy *et al.* conducted a multicenter prospective longitudinal cohort research. They discovered that out of 1130 hips examined, 47.6% had cam morphology, 44.5% mixed morphology, and 7.9% had pincer morphology [20]. Over the past 20 years, there has been a significant change in the surgical methods used to treat femoroacetabular impingement. At first, the preferred surgical methods were open dislocation and osteochondroplasty, with good early- to mid-term

outcomes. Since arthroscopic procedures are minimally invasive and yield strong short-term results, they have virtually supplanted them and are now accepted as standard. On the other hand, Beaulé *et al*. operated on 37 hips of 34 patients with cam FAI, utilizing open dislocation combined with osteochondroplasty of the femoral neck.the functional results in this study were rated using the WOMAC (Western Ontario and McMaster Universities) score, which grew from 61.2 points preoperatively to 81.4 points postoperatively with an average follow-up of 3.1 years ($p< 0.001$). Furthermore, the mental component of the 12-item Short Form questionnaire increased from 46.4 to 51.2 (p=0.031), while the University of California at Los Angeles activity score improved from 4.8 to 7.5 ($p<0.001$) [2]. Patients with femoroacetabular impingement (FAI) have shown significant improvements after receiving open treatment; significant changes in scores on the iHOT 12, EQ-5D Index, the SF-12, and the IHOT-12 have been documented. However, it is important to consider the impact of preexisting hip pathologies and comorbid conditions on the outcomes of open osteochondroplasty. We started this study in the hopes of presenting a solid opinion on the efficacy of open osteochondroplasty by utilizing extensive assessments such as the EQ-5D Index, SF-12, and iHOT-12 to compare the data with similar results in the existing literature.

Methodology

The purpose of this prospective cohort study was to ascertain the results of open osteochondroplasty for femoroacetabular impingement over a brief follow-up period. By the conclusion of this follow-up period, it was anticipated that participants' pain, function, and range of motion would have improved with surgical intervention. This study included 31 participants who were diagnosed with femoroacetabular impingement. The patients were prospectively enrolled from the orthopedic department of National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Bangladesh, between January 2022 and December 2023. In this study, the included cases were patients from the age range of 12–20, whose diagnosis of FAI was established by clinical examination and imaging (MRI or CT scan), and symptoms persisted for at least six months after non-operative treatment. Exclusion criteria was having had prior hip surgery. All procedures were carried out by the same senior orthopedic surgeon who performed open osteochondroplasty. Using an anterior Smith-Petersen technique, we put the patient in a supine position and medially retracted the sartorius and straight head of the rectus. A blunt dissection was done to the reflected head of the rectus. On the capsule, an inverted T incision was made. The operation involved anterior hip dislocation to expose the acetabulum and femoral head; impinging bony spurs were excised; and the acetabulum and femoral head were remodeled to reduce mechanical impingement. All surgical treatments and techniques were fairly standard for everyone, with a focus on the treatment of pre-existing hip pathologies and concomitant diseases. Pain was assessed using the Visual Analog Scale (VAS), where patients rated their pain on a scale from 0 (No pain) to 10 (Worst pain imaginable). Functional outcomes were measured through the Hip Outcome Score (HOS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the International Hip Outcome Tool (iHOT-12). Assessment of Quality of Life was measured with EQ-5D Index (Overall health-related quality of life, from 0 to 10 and SF-12 (General health measure). A goniometer was used to measure the range of motion, and the following parameters were measured: hip flexion, extension, internal rotation, and exterior rotation. Measurements were taken preoperatively and at 6 weeks, 3 months, and 6 months postoperatively. Prospective data was collected at predetermined intervals of follow-up. Descriptive statistics were used to summarize the baseline parameters, outcome measures, and patient demographics. Depending on normality, paired t-tests or Wilcoxon signed rank tests were used to compare continuous variables between pre- and post-operative times. Chi-square tests were used to compare categorical data. A statistically significant p-value was less than 0.05. Data was analyzed using SPSS, version 28.0.

Result

The study cohort comprises 31 patients who underwent open osteochondroplasty for FAI; the mean follow-up is 12.5 months, the minimum and maximum being respectively six and 24 months. The demographic characteristics show that 48% (15) of cases were between the ages of 15 and 17 years and 33% (10) of cases were within the age range of 18 to 20 years, and 19% (6) were in the 12 to 14 years' age group. Males made up the majority of the sample, including 18 patients or 59% of the total. The results for the 31 patients who underwent open osteochondroplasty for FAI were significantly improved preoperatively versus postoperatively. The mean VAS pain score preoperatively was 7.4, with a range of 5-10, while this score had significantly decreased to 3.1 (Range 0-6) postoperatively, which constitutes a reduction in the pain levels by 58% ($p< 0.01$). The WOMAC scores also improved considerably. The mean pain domain score decreased from 21.6 (range 14-32) preoperatively to 10.2 (Range 4-18) postoperatively, indicating a 53% reduction in pain-related symptoms ($p<0.01$). The stiffness domain improved from a mean score of 8.9 to 4.3, representing a 52% improvement ($p<0.01$). The score for the physical function domain increased from 38.7 (range 26–60) to a postoperative value of 22.4 (range 12–36), reflecting a 42% enhancement in the physical function domain ($p< 0.01$). The average Hip Outcome Score increased significantly from 47.3 to 68.2, with a range of 30-60 and 45-85, respectively, at $p< 0.01$. The iHOT-12 scores improved significantly, with the mean score changing from 35.0, range 20-50, to 60.0, range 45-75; this represents an increase of 71% in hip-specific health status at $p< 0.01$. The EQ-5D Index, which reflects health-related quality of life, also showed significant improvement: the mean score increased from 0.56 (range 0.30–0.80) to 0.80 with a range of 0.60–1.00 after surgery ($p< 0.01$). Similar improvements were noted in SF-12 scores: Physical Component Summary changed from 35.4±10.3 (range 25–50) to 50.2±5.9 (range 40–60) ($p< 0.01$); the Mental Component Summary increased from 40.5±11.4 (range 30–55) to 52.1±7.5 with a range of 40–65 ($p< 0.01$). In terms of range of motion, the hip flexion improved from a mean of 95 degrees (range 70–120 degrees) preoperatively to 110 degrees, with a range of 85–125 degrees postoperatively, for a mean increase of 15 degrees with $p< 0.01$. Internal rotation also increased from a mean of 15 degrees with a range of 5–25 degrees to a mean of 25 degrees with a range of 10–35 degrees with $p< 0.01$. The complications were few: 1 patient with transient sciatic nerve irritation (3.2%) and 1 patient with superficial wound infection (3.2%). No cases of deep infections or significant intraoperative complications were reported. Patient satisfaction was very high, reflected by the marked improvement in the quality of life in 85% (26 patients) of the patients and satisfaction with their postoperative functional recovery in 78% (24 patients).

Table 1: Age distribution of participants (N=31)

Age (Years)	Number of Patient	Percentage
12-14 Yrs.	6	19%
15-17 Yrs.	15	48%
18-20 Yrs.	10	33%

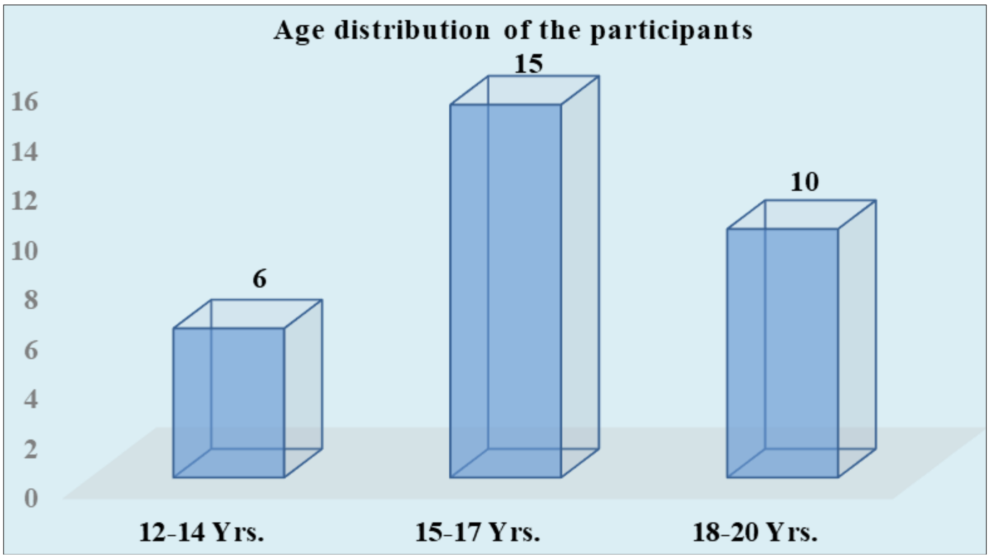


Fig 1: Column chart showed age wise participants distribution (N=31)

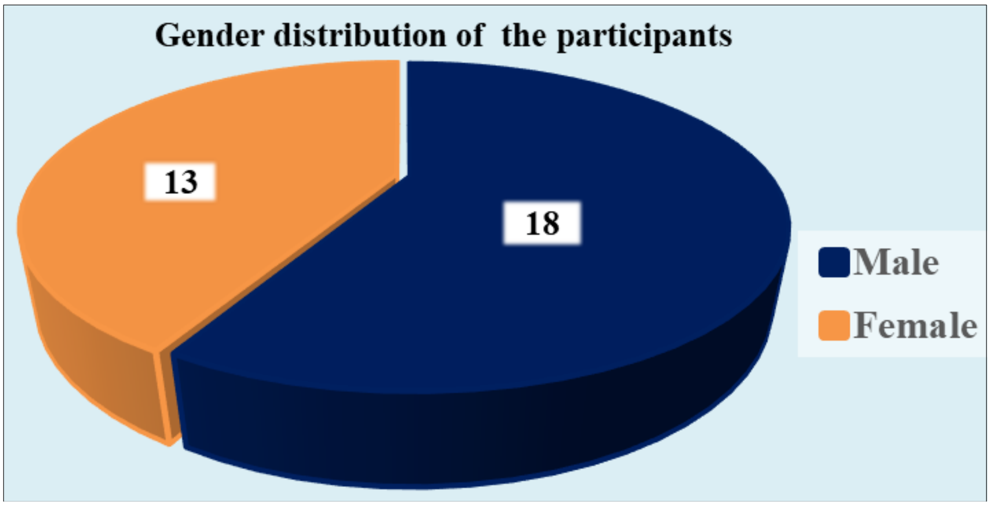


Fig 1: Pie chart showed gender wise participants distribution (N=31)

Table 2: VAS (Visual Analog Scale) Pain Score (N=31)

Measure	Preoperative	Postoperative	Change	p-Value
Mean Score	7.4 (Range: 5–10)	3.1 (Range: 0–6)	58%	< 0.01

Table 3: WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) Scores (N=31)

WOMAC Score Domain	Preoperative MS (Range)	Postoperative MS (Range)	Change	p-Value
Pain	21.6 (14–32)	10.2 (4–18)	53%	< 0.01
Stiffness	8.9 (5–14)	4.3 (1–9)	52%	< 0.01
Physical Function	38.7 (26–60)	22.4 (12–36)	42%	< 0.01

Table 4: Hip Outcome Score (HOS) (N=31)

HOS Domain	Preoperative (Range)	Postoperative (Range)	Change	p-Value
Mean Score	47.3 (30–60)	68.2 (45–85)	44%	< 0.01

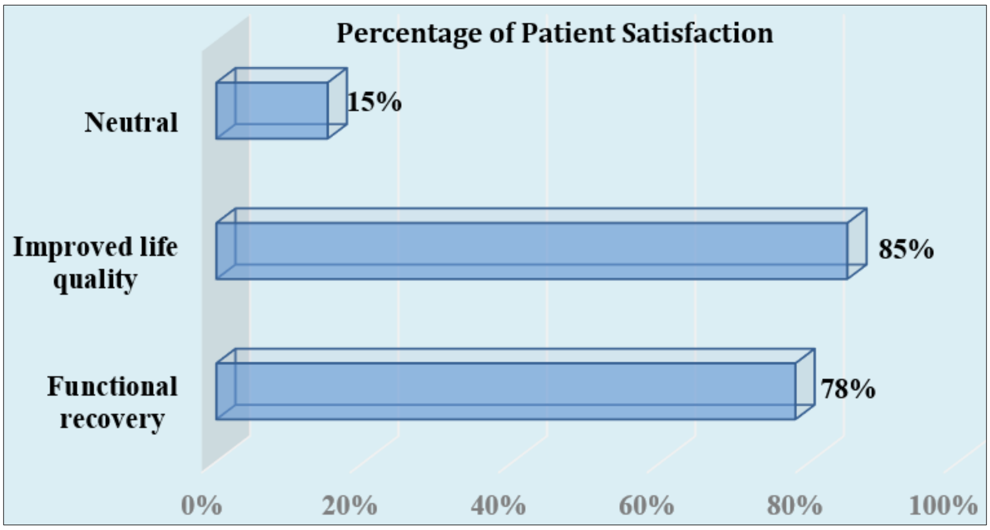
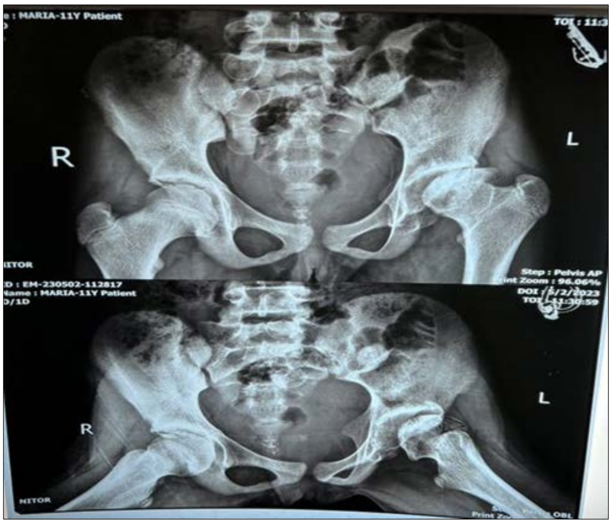


Fig 3: Bar chart showed percentage of patient satisfaction (N=31)



Picture 1: Maria, 12 yrs. old FAI (LT Side) A/P view & frog leg view

Picture 3: 3-month Follow up of osteochondroplasty (LT) side

Picture 2: Immediate postoperative x ray (A/P view) (Osteochondroplasty done)

Picture 4: 6-month Follow up of osteochondroplasty (LT) side

Picture 1: Fahim 12 yrs. Old (Rt) FAI due to LCPD (Healing stage)

Picture 2: Immediate post-operative x ray- osteochondroplasty & CST transfer done

Picture 3: 3 month F/up

Picture 4: 6 month F/up

Discussion

At a mean follow-up of 12.5 months, this study showed that open osteochondroplasty for FAI may result in a significant improvement in patient-reported outcome. Following the research, 31 individuals showed statistically significant improvements in their pain levels, functional ratings, and range of motion in the afflicted joint. A significant reduction in pain, as measured by the difference in the VAS (Visual Analog Scale) pain score, was observed in this study. The average VAS decreased from 7.4 before surgery to 3.1 thereafter; this is a 58% drop that is statistically significant ($p < 0.01$). This reduction in pain is crucial for improving patients' quality of life and functional capabilities. In addition, hip function improved 44% ($p < 0.01$) after surgery, with an average Hip Outcome Score rising from 47.3 pre-surgery to 68.2 post-surgery. The WOMAC ratings demonstrated favorable, statistically significant average changes: there was a 53% increase in the painful domain (21.6 to 10.2), indicating a notable improvement in quality of life and a considerable reduction in pain. The WOMAC domain had improved significantly. Physical function rose by 42% and stiffness increased by 52%, respectively ($p<0.01$). These enhancements are consistent with prior research examining open osteochondroplasty outcomes for FAI, which discovered comparable outcomes in relation to functional recovery [7, 10, 11, 21]. The patient-reported outcome measures showed a substantial increase. Hip-specific quality of life was measured by the iHOT-12 score, which rose from a mean of 45 preoperatively to 65 postoperatively, indicating a mean improvement of 44%. The average score of the EQ-5D Index increased dramatically, from 0.45 to 0.62, with an MCID of 0.074, indicating a positive correlation with overall health. With MCID = 4 points, the SF-12 Physical Component Summary (PCS) score rose from 30 to 34 points in relation to the physical health average score. At 12 months, the SF-12 MCS MCID was reached for the cohort patients group, but not for the trial patients group. These outcomes highlight the procedure's all-encompassing effects on hip-specific and general health outcomes. And the fact that that range of motion, or ROM, has grown is astounding. From 95 in the preoperative period to 110 in the postoperative period, flexion improved by 15 degrees on average ($p < 0.01$). The average improvement in internal rotation is 10 degrees, with a range of 15 to 25 degrees ($p < 0.01$). These outcomes attest to the intervention's efficacy in regaining hip joint mobility, which is necessary for a full functional recovery. But it is also important to consider the results for open osteochondroplasty in relation to preexisting hip pathologies and comorbid conditions. Patients included in the study were those without any comorbid condition, including inflammatory arthritis and any other preexisting hip pathologies. Such exclusion probably accounts for the better results observed. It has been found in earlier studies that co-morbid conditions, like obesity, diabetes, and inflammatory conditions, can be a potent ground for poor surgical outcomes and recovery difficulty. Complications in our study were minimal. We observed transient sciatic nerve irritation in 1 patient (3.2%) and superficial wound infections in 1 patient (3.2%). No significant intraoperative complications or deep infections were reported. Therefore, our study supports the efficacy of open osteochondroplasty for the treatment of femoroacetabular impingement. The procedure produced significant improvement in pain relief and functional outcomes with improvement in range of motion and minimal complications, hence proving open osteochondroplasty to be an effective treatment option for FAI.

Limitation of study

The study was carried out over a short period of time at a single center with limited cases. Therefore, there is a possibility that this may not represent the broader scenario.

Conclusion

Our findings, throughout the study, were notable. Open osteochondroplasty for FAI has shown significant pain reduction, improved function, and increased range of motion, all of which have been very beneficial to the patients enrolled. This study did not, however, look into the impact of preexisting conditions on these results and hence generalizes very little. Further research needs to be done in order to investigate these factors and their interaction effects. Furthermore, the selected surgical method has a major impact on the procedure's effectiveness. Surgeons can conduct many impingement operations from a single exposure using the safe surgical dislocation technique and the anterior Smith-Petersen approach. These procedures are quite versatile. In addition to offering the possibility of post-phoning or slowing the progression of chondral disease, the surgical intervention of FAI using these techniques has greatly improved patient symptoms. This underscores the significance of choosing the right surgical attempt in order to achieve the best possible patient outcome and address the complex nature of FAI.

Recommendations

Apart from proper pre-operative evaluation, control of pre-existing hip problems and other systemic illnesses may help in improving the outcome. A well-individualized plan for treatment and careful post-operative care should receive preferential priority. Future research would include randomized studies with larger samples, multi-centric studies and longer follow-ups to elucidate the long-term effects and possible complications.

Conflict of Interest

Not available

Financial Support

Not available

References

1. Grammatopoulos G, Laboudie P, Fischman D, Ojaghi R, Finless A, Beaulé PE. Ten-year outcome following surgical treatment of femoroacetabular impingement. Bone Jt Open. 2022;3(10):804-814.
2. MacFarlane RJ, Konan S, El-Huseinny M, Haddad FS. A review of outcomes of the surgical management of femoroacetabular impingement. Ann R Coll Surg Engl. 2014;96(5):331-338.
3. Bloomfield MR, Erickson JA, McCarthy JC, *et al*. Hip pain in the young, active patient: surgical strategies. Instr Course Lect. 2014;63:159-176.
4. Maupin JJ, Steinmetz G, Thakral R. Management of femoroacetabular impingement syndrome: current insights. Orthop Res Rev. 2019;11:99-108.
5. Ito K, Minka MA 2nd, Leunig M, Werlen S, Ganz R. Femoroacetabular impingement and the cam-effect. A MRI-based quantitative anatomical study of the femoral head-neck offset. J Bone Joint Surg Br. 2001;83(2):171-176.
6. Kuhns BD, Frank RM, Pulido L. Open and Arthroscopic Surgical Treatment of Femoroacetabular Impingement. Front Surg. 2015;2:63.
7. Srinivasan SC, Hosny HA, Williams MR. Combined hip arthroscopy and limited open osteochondroplasty for anterior femoroacetabular impingement: early patient reported outcomes. Hip Int. 2013;23(2):218-224.
8. Chambers CC, Zhang AL. Outcomes for Surgical Treatment of Femoroacetabular Impingement in Adults. Curr Rev Musculoskelet Med; c2019.
9. Spencer AD, Hagen MS. Predicting Outcomes in Hip Arthroscopy for Femoroacetabular Impingement Syndrome. Curr Rev Musculoskelet Med. 2024;17(3):59-67
10. Ayeni OR, Karlsson J, *et al*. Osteochondroplasty and Labral Repair for the Treatment of Young Adults With Femoroacetabular Impingement: A Randomized Controlled Trial. The American Journal of Sports Medicine. 2021;49(1):25-34
11. Kay J, Simunovic N, Ayeni OR, *et al*. Effect of Osteochondroplasty on Time to Reoperation After Arthroscopic Management of Femoroacetabular Impingement: Analysis of a Randomized Controlled Trial. Orthopaedic Journal of Sports Medicine. 2022;10(4).
12. Mohtajeb M, Cibere J, Mony M, *et al*. Open MRI assessment of anterior femoroacetabular clearance in active and passive impingement-provoking postures. Bone Jt Open. 2021;2(11):988-996
13. Simunovic N, Heels-Ansdell D, Thabane L, *et al*. Femoroacetabular Impingement Randomised controlled Trial (FIRST) - a multi-centre randomized controlled trial comparing arthroscopic lavage and arthroscopic osteochondroplasty on patient important outcomes and quality of life in the treatment of young adult (18–50 years) femoroacetabular impingement: a statistical analysis plan. Trials. 2018;19:588.
14. Banerjee P, McLean CR. Femoroacetabular impingement: A review of diagnosis and management. Curr Rev Musculoskelet Med. 2012;5(4):315.
15. Spencer AD, Hagen MS. Predicting outcomes in hip arthroscopy for femoroacetabular impingement

syndrome. Curr Rev Musculoskelet Med. 2024;17(3):59-67.
16. O'Rourke RJ, El Bitar Y. Femoroacetabular Impingement. In: StatPearls. StatPearls Publishing; June 26, 2023.
17. DiSilvestro K, Quinn M, Tabaddor RR. A Clinician's Guide to Femoacetabular Impingement in Athletes. R I Med J (2013). 2020;103(7):41-48. Published 2020 Sep 1
18. Buzin S, Shankar D, Vasavada K, Youm T. Hip Arthroscopy for Femoroacetabular Impingement-Associated Labral Tears: Current Status and Future Prospects. Orthop Res Rev. 2022;14:121-132.
19. Ejnisman L, Ricioli Júnior W, Queiroz MC, Vicente JRN, Croci AT, Polesello GC. Femoroacetabular Impingement and Acetabular Labral Tears - Part 1: Pathophysiology and Biomechanics. Rev Bras Ortop (Sao Paulo). 2020;55(5):518-522.
20. Jeremiah J Maupin, Garrett Steinmetz, Thakral R. Management of Femoroacetabular Impingement Syndrome: Current Insights. Orthop Res Rev. 2019;11:51-60.
21. Nwachukwu BU, Rebolledo BJ, McCormick F, Rosas S, Harris JD, Kelly BT. Arthroscopic Versus Open Treatment of Femoroacetabular Impingement: A Systematic Review of Medium- to Long-Term Outcomes. Am J Sports Med. 2016 Apr;44(4):1062-8.

How to Cite This Article
Md. Al Hasan M, Salam SI, Mozumder B, Hossen MA, Md. Rashid H, Mandal T. A study on short term functional outcome of open osteochondroplasty for femoroacetabular impingement. International Journal of Orthopaedics and Traumatology 2024; 6(1): 83-89.