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Research Article

Comparative study between capsular repair and non capsular repair after hip arthroscopy in treatment of femoroacetabular impingement

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Abstract

Background: The aim of this study is Comparative study between capsular repair and non capsular repair after hip arthroscopy in treatment of femoroacetabular impingement regarding improvement of different scoring system. **Methods:** This retrospective study was held between June 2018 and October 2022 was conducted on patients with femoro-acetabular impingement who were treated with hip arthroscopy with particular reference whether the capsule is repaired or not with 20 patients for each group. **Results:** Twenty patients (11 female patients, 9 male patients) without repair of the capsulotomy were matched, and 20 patients with repaired capsulotomy(7 females ,13 males). The average age for both groups was (41.05 ± 3.32,31.80 ±2.71),respectively he mean follow-up time was 8.55 ± years and 3.05 ± 1.15 years for the non repair and repair group, respectively. Patients in the repair group is statistically significant better scores post-operative than pre-operative in capsular group There is statistically significant better scores post-operative than pre-operative in non-capsular group. However There is no statistically significant difference between patients who do capsular and noncapsular repair as regard the pre-operative scoring system.

Conclusions: Arthroscopic capsular repair, used in conjunction with arthroscopic hip preservation surgery, appears to be safe and did not negatively influence the hip but the use of capsular repair did not show clinically relevant superiority over the use of unrepaired capsulotomy Level of evidences:level III therapeutic case series

Key words: labrum, FAI,capsule, hip arthroscopy

Introduction

Femoro acetabular impingement (FAI) is a pathological hip disease is characterized by inappropriate contact between and the femoral head neck junction and the acetabulm this may occur within the normal physiological range of motion due to femoral deformity known as cam or acetabular deformities called pincer[(1)].

Cam the form of deformities are caused the abnormal bony prominence through superior is femoral head neck Junction however pincer deformities are caused by abnormalities in the shape and or orientation of the acetabulum ,additionally, some people have hosts both malformations which is referred as combined pathology. If the femoral neck continually contacts the acetabular ,the rim of the labrum and surrounding cartilage may suffer damage over time and cause more serious degenerative illness in the form of osteoarthritis.[(2,3)].

Once FAI has been definitely diagnosed, the patients symptoms should be taken into account however, selecting non surgical or surgical options, non surgical therapy is to avoid aggravating activities for a while, maintaining muscular strains and use anti-inflammatory drugs just relief the symptoms however none of this is approach dealing with morphological issues[(4)].

Hip dislocation surgery is the first surgical method used to treat FAI. Ganz et al.,[(1)]create a technique for treatment FAI that involves open surgical dislocation, also mini arthrotomy has

been proposed as an alternative to surgical hip dislocation for the treatment of FAI.[23] Hip arthroscopy is a procedure that gain popularity now a days as technique evolve the indication for hip arthroscopy are expanding and improving as it has rapid healing time the medial femural circumflex artery is less likely to be harmed even though the use of hip arthroscopy [5,6,7] .

With the dramatic increase of hip arthroscopy over the past several decades due to improved of its surgical method and the repair hip capsule after capsulotomy during hip arthoscopy is a subject that is still in debate due to its role in the anatomical limitation of the hips joint distraction as well as the capsulotomy is necessary to perform the intra articular procedure such as acetabulum femuroplasty and the Labral repair the most common technique for managing the capsule issue is intercapsulatomy which involve incision the iliofemoral ligament between the anterolateral and the mid anterior or a direct anterior portal.[8]

In this study Compares the capsule repair or non-capsular repair after hip arthroscopy for treatment of femuru astabulary impingement and the enhance the scoring system

Patients and methods

Patient with FAI was treated with hip arthroscopy in this retrospective study between 2018 and 2022 with particular attention to however the capsular is repaired or not data was collected and the statistical work was performed it and reviewed in Minia University Hospital Egypt and all patient was requested as volunteer for this study with the concent and hospital ethical committee was asked to approve it.

Inclusion criteria; 1-age 20 to 50 years 2-patient with a proper symptoms and the clinical indicators of FAI such as flection abduction internal rotation test and those who haven't responded to a conservative treatment as analgesics, physical therapy and and/or intra articular injection 4 –all patients considered to be in this study should have cam, pinser or compiled type of impingement documented by antro posterior view 45 dunn view and the Frog leg radiograph as with as well as with a sophisticated image such as MRI or MRA and surgically treated by hip arthroscopy.

Exclusion criteria; 1- age extremities less than 20 or greater than 50 patient with also hight grades of tonnis scale (3-4), 2- patients with rheumatology illness, history of slipped capital femural Ephyphesis prior hip surgery severe dysplasia or septic arthritis or patient died while receiving follow up.

Non-Repair Group the majority of the full up data from the midterm and long term period later patient received the capsular repair as a conventional treatment patient who are underwent repair with the midterm or short full up. Pre-operative and post operative clinical outcome scores were compared between the two groups (mHHS, HOS ADL. HOS SSS, NAHS)

Surgical method

The patient who was given either the spinal epidural combination with a general or conscious anesthesia before being placed in the modified super imposition on the fracture table the operative side can help is distracted while a small amount of traction was applied to the non-operative side until the copy evaluation revealed 10 millimeter of the joint space opening the antero lateral and the mid anterior portal are created with the foot internally rotated 35 degree

A blade was used to do 2.5 centimeter capsulotomy 10 mm away from the labr altip from 12 to 3 o'clock the incision runs parallel to the acetabular rim the capsulotomy uniform length primated all the patient to have their cam completed and the pincer lesion was treated by a acetabuloplasty using 4.5 mm arthroscopic burr and the rim was cur to create a bleeding bit on the bone in order to heal of the labum over the course of the trial no modifications to rim trimming technique or observant suture anchors are used to repair the Labrum and they were positioned on the acetabular rim between 1 to 1.5 centimeter interval until the labral tissue is sufficiently fixed to the acetabulum the size of the suture anchor selected over the course of the study years and the fundamental method of celebrity healing Remains the Same

The shaver and 5.5 millimeter beer which remains the same throughout the trial period were used to contact cam osteoplasty to treat the cam lesion using this outerbridge classification the cartridge state was assisted and denoted stable cartilage was removed in case of outer bridge type 1 or type 2 cartridge region the knee is bent 45 degree once the intra articular phase of arthroscopy is finished and in order to graduate relax the capsule a suture passer is positioned in the Antero lateral Porter while the camera was enter through mid anterior portal and the approximal side of the capsulatomy was punctured the capsule tissue was cut through number two nylon suture lasso with the distant side of the capsulotomy was in transversed by lasso for the repair and observable suture is introduced with a lasso into the capsular tissue on both sides of the capsulotomy have each not alternated to secure the fix the side to side closure is successfully completed three three pair suture in total were inserted .To visualize the repair and make sure that it is not over tightened the hip was then extended rehabilitation they both adheres the same setup we plan all the patient ware maintain 20 pound weight for a limit for four weeks while using crutches after separation for the service three weeks with prohibition of hip extension abduction in addition safety when sleep and to rotational cluster were implied 6 hours per day were spent on a continuous passive motion machine and then the 45 degree for the first week 0 to 60 for the second zero to 70 in the third and 0 to 80 for the force moreover the stationary cycle without maintenance up until 6 weeks after surgery

Results and statistics

Statistical analysis design:- Statistical analysis design: Data collected were reviewed and coding of the collected data was done manually. These numerical codes were fed to the computer where statistical analysis was done using the Statistic Package for Social Science Version 22 (SPSS 22) for windows.

A) Descriptive statistics:

1- Quantitative data: were presented as mean and standard deviation (mean ± SD)

2- Qualitative data: were expressed as numbers and percentage

B) Analytical statistics

- Comparing groups was done using

1- Chi square-test (X^2) :for comparison of qualitative data.

2- Student's "t"- test for comparison of quantitative data of 2 independent sample.

3- Study of the relationship between variables was done using correlation coefficient "Pearson correlation".

4- Receiver operating characteristic curves (ROC) were used to identify sensitivity, specificity and determine optimal cut-off points of biomarkers for prediction of SBP. Sensitivity = true positive / (true positive + false negative). Specificity = true negative / (true negative + false positive).

The coefficient interval was set to 95%. The level of significance was calculated according to the following probability (P) values: $P<0.05$ was considered statistically significant.

Table 1 : Comparison of demographic data of the studied population

		Capsular	Non capsular	Independent student T test/ chi-square test	
		N=20	N=20	t/X2	p-value
Age years	**Range**	27-36	34-45	-9.664	<0.0001
	Mean ± SD	31.80 ±2.71	41.05 ± 3.32		
BMI	**Range**	16.9-26.03	17-24.78	-0.373	0.711
	Mean ± SD	20.23 ± 2.51	20.51 ± 2.23		
Sex	**Male**	13 (65%)	9 (45%)	1.616	0.204
	Female	7 (35%)	11 (55%)		

There is no statistically significant difference between patients who do capsular and non-capsular repair as regard the sex, BMI and the side of operation. Age of patients who do capsular repair was significantly lower and non-capsular repair.

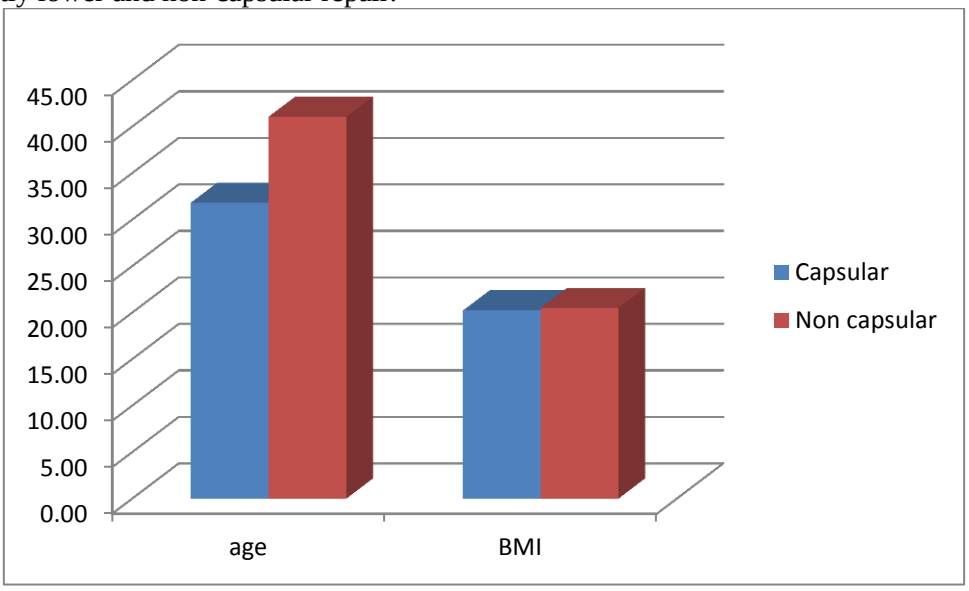

Figure 1: age and BMI of the studied population

Table 2 : Comparison of clinical data of the studied population

		Capsular	Non capsular	Independent student T test/ chi-square test	
		N=20	N=20	t/X2	p-value
Side	Right	11 (55%)	9 (45%)	0.400	0.227
	Left	9 (45%)	11 (55%)		
The duration of follow up	Range	2 - 5	7 - 10	-13.658	<0.0001
	Mean ± SD	3.05 ± 1.15	8.55 ± 1.19		

The duration of follow up of patients who do capsular repair was significantly lower and non-capsular repair. There is no statistically significant difference between patients who do capsular and non-capsular repair as regard the side of operation.

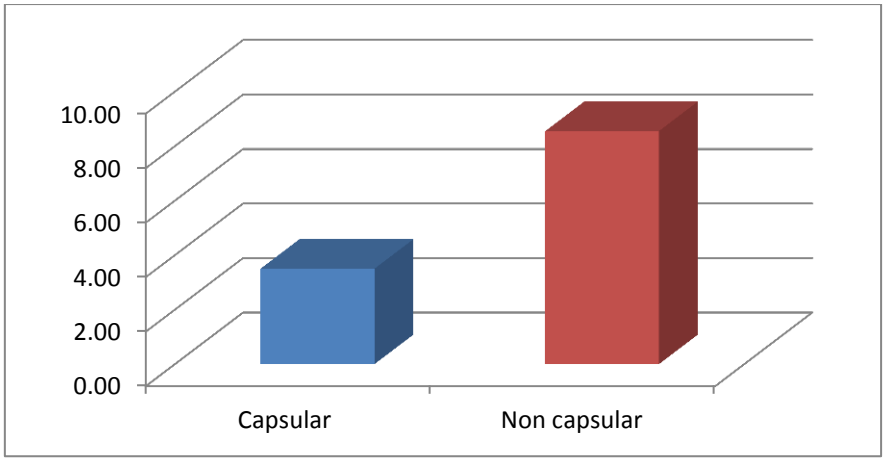

Figure 2: The duration of follow up of the studied population

Table 3: Comparison of pre-operative scoring system of the studied population

	Capsular N = 20		Non capsular N = 20		Independent student T test	
	mean	SD	mean	SD	T	p-value
NAHS	62.63	15.59	66.40	11.75	-0.865	0.392
MHHS	69.14	15.98	72.40	12.30	-0.724	0.473
HosAdl	66.21	14.45	67.62	18.74	-0.267	0.791
HosSport	50.56	17.29	51.16	18.32	-0.107	0.915
VAS	5.65	0.99	5.50	1.10	0.454	0.653

There is no statistically significant difference between patients who do capsular and non-capsular repair as regard the pre-operative scoring system.

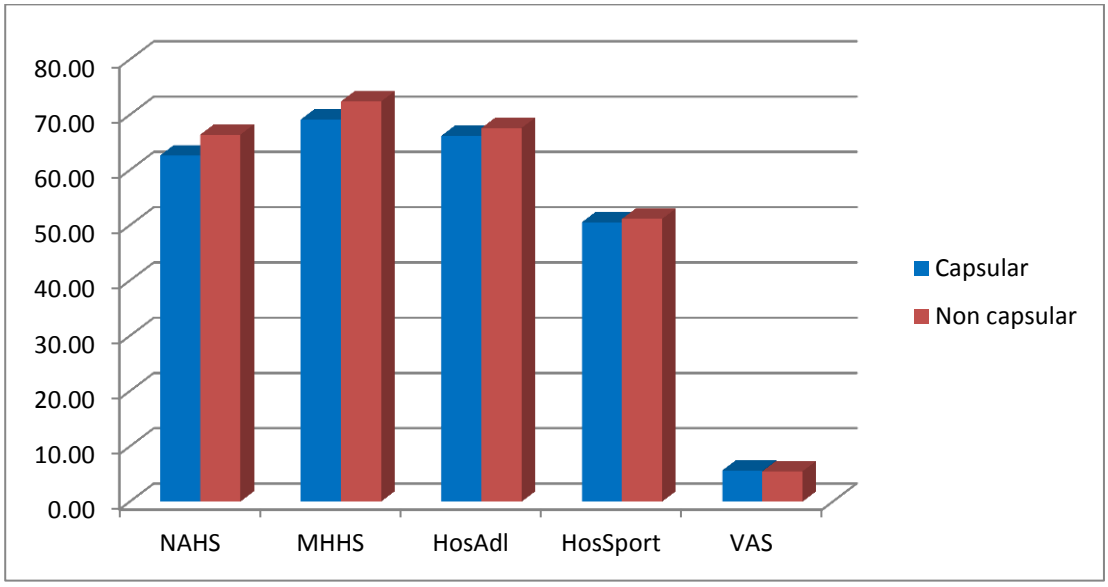

Figure 3: pre-operative scoring system of the studied population

Table 4: Comparison of post-operative scoring system of the studied population

	Capsular N = 20		Non capsular N = 20		Independent student T test	
	mean	SD	mean	SD	T	p-value
NAHS	90.61	9.68	91.65	5.10	-0.426	0.672
MHHS	88.93	9.50	86.89	12.19	0.588	0.560
HosAdl	95.78	5.16	89.47	20.30	1.349	0.185
HosSport	91.24	10.77	90.35	8.57	0.289	0.774
VAS	0.95	1.10	1.20	0.83	-0.811	0.423

There is no statistically significant difference between patients who do capsular and non-capsular repair as regard the post-operative scoring system.

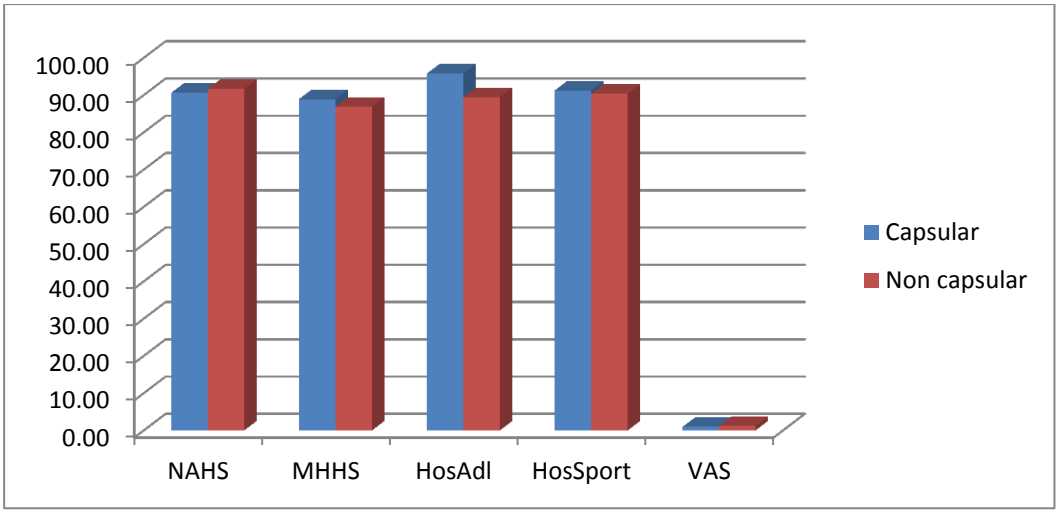

Figure 4: post-operative scoring system of the studied population

Table 5: Comparison of pre-and post-operative scoring system of capsular group

	pre- operative N = 20		post-operative N = 20		Independent student T test	
	mean	**SD**	**mean**	**SD**	**T**	**p-value**
NAHS	62.63	15.59	90.61	9.68	-6.82	<0.0001
MHHS	69.14	15.98	88.93	9.50	-4.761	<0.0001
HosAdl	66.21	14.45	95.78	5.16	-8.621	<0.0001
HosSport	50.56	17.29	91.24	10.77	-8.93	<0.0001
VAS	5.65	0.99	0.95	1.10	14.222	<0.0001

There is statistically significant better scores post-operative than pre-operative in capsular group .

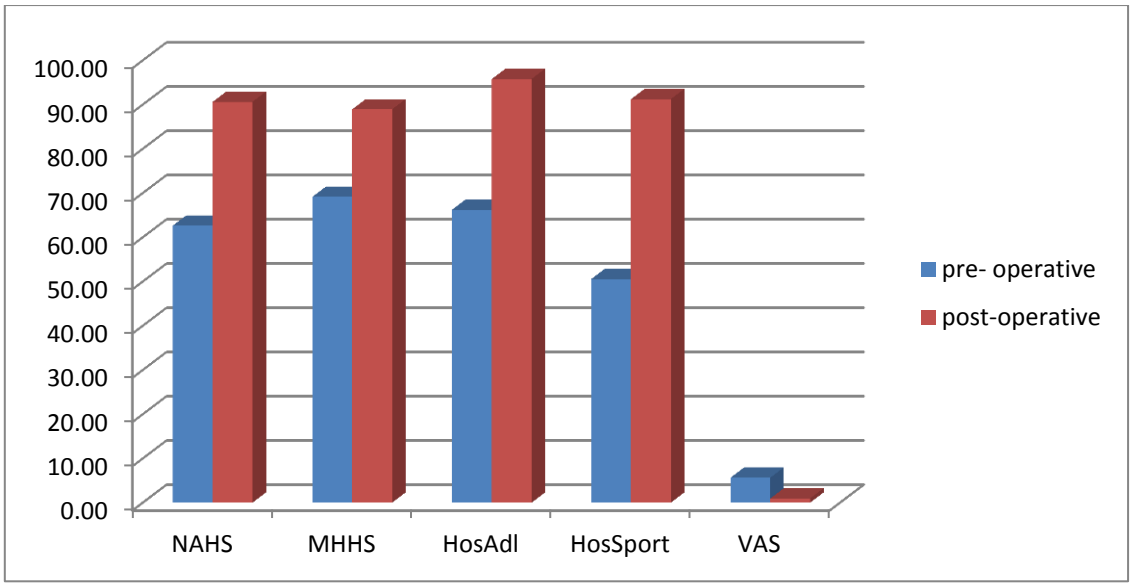

Figure 5: post-operative than pre-operative scoring system in capsular group

Table 6: Comparison of pre-and post-operative scoring system of non-capsular group

	pre- operative N = 20		post-operative N = 20		Independent student T test	
	mean	SD	mean	SD	T	p-value
NAHS	66.40	11.75	91.65	5.10	-8.814	<0.0001
MHHS	72.40	12.30	86.89	12.19	-3.743	0.001
HosAdl	67.62	18.74	89.47	20.30	-3.537	0.001
HosSport	51.16	18.32	90.35	8.57	-8.662	<0.0001
VAS	5.50	1.10	1.20	0.83	13.932	<0.0001

There is statistically significant better scores post-operative than pre-operative in non-capsular group

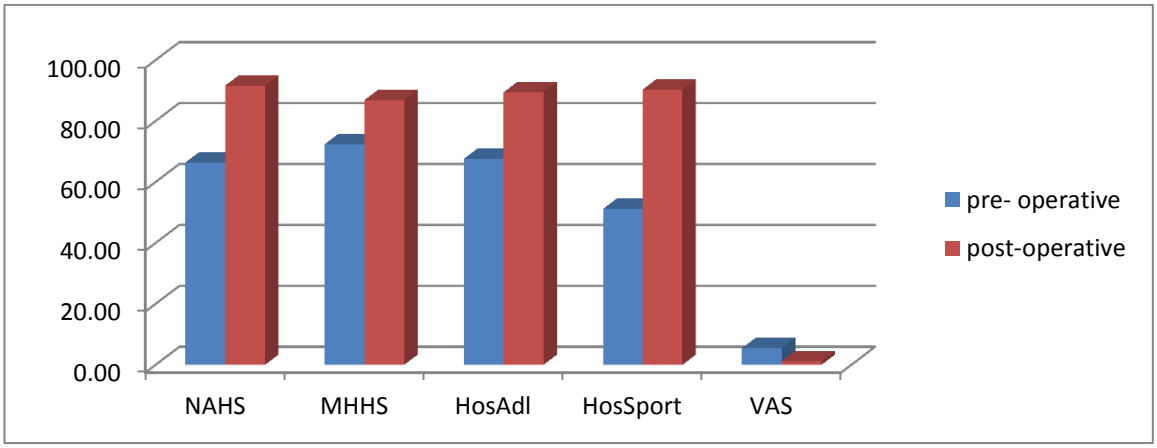

Figure 6: post-operative than pre-operative scoring system in non-capsular group

Discussions

The four ligamentous component that make up the hip capsule or the ilofemoral ligament, pubo femoral ligament and ischio femoral ligament and zona orbicularis the names as a description of this structure are giving according to their anatomic placements[2]

Numerous cadaveric studies have examined show capsulotomy alerts the Hips biome-chanical properties[9-13]. T capsulotomy increases the Hips external rotation according to Abrams et al.,[19] khair eta[11] have demonstrated that after capsulatomy the capsule fully closes restoring the Hips by mechanical properties according to research of Baha et al.,([12] hip joint kinematics are almost restored following the interporter or City capital Mayers et al.,[13] demonstrated in research that the injuries of the iliofemora; ligament produce an increase of anterior translation and that joint capsule is essential for stability according to the cadaveric study of philipon et al.,[15] showed that the interportal and t capsulotomy significantly increased the Hips range of motion during external rotation additionally they found that neither kind of capsulatomy repair completely restore the natural range of rotation.

Previous biomechanical models prediction that the interportral and t casuelotomy would be enhanced anterior translation motion of the joint during motion and the decrease the force required for distraction after restoration, the capsule can resume its normal function which encourage some surgeon to employ capsular repair method.[16]. .Despite of the finding of this cadaveric studies question that of what to do

with the capsule after hip arthroscopy is still a continuous one survey of orthopedic surgery related that 78% of the Physicians thought the decision to do capsular repair relayed on the situation there has been movement in the recent years store to the more frequent capsular pair according to the recent analysis by Riff et al.,[9] according to data from 2017, 58% of capsulotomies where routinely repairs as opposed to 7% of a studies from 2009 and 2011[17] .

The impact of Regular capsular repair on the patient reported outcome is still unknown even who are regular capsular closure during the hip growing in popularity[18]. There are currently only few number of application reported was high quality data the strongest body of data currently available in this field level 2 and level 3 evidence support the capsular repair or placation in the revision of the hip scenario complete closure after the initial hip are subscribe treatment of FAI is not related to the clinical meaning meaningful difference in the patient result at the end of the treatme. After the first arthroscopy of FAI surgeon go to do t capsulotomy may find that the patient benefit from the capsular re pair but not such improvement have seen after the interportal access.[19].

According to our results in retrospective study in total of 40 patients were included in this study 20 patients of each group (22 male, 18 females) . The remainder of the demographic data was not significantly different between CR and NR groups apart from age of patient and duration of follow up who do capsular repair was signicantly lower. All the scoring system is significantly improved at final evaluation and the preoperative scoring system in both groups in the from NAHS, mHHS, HOS-ADL, (HOS-Sports subscale, VAS. However there was no significant difference in post operative evaluation between the two groups.

Frank et al.,[21] on the other hand hypothesis that the hip arthroscopy would benefit to improve sports specific results and lower revision rate if they got normal capsular closure as opposed the two partial capsular repair as early as 2.5 years. In a review Young et al.,[22] came to conclusions that the hip displasia hyperlaxity, female gender are risk factors for the development of issue resulting in unstable articulation in addition to the iliopsoas debridment and unrepared capsulotomy.

Is a fundamental concerns is a micro stability may contribute to the arthrocopscopis therapeutic failure and the need of the revision. Economopoulus et al.,[23] evaluated the capsular repair ,interportal capsulotomy and T capsuotomy techniques in a prospective randomized review of capsular management strategy utilize it during the hip arthroscopy this interportal, and t capsulotomy which they had not being repaired should lower mHHS and HOS adl than the capsular Repair Group in while the interportal capsulotomy group has better score than the t capsulutomy group both trials suggest the repair of the following capsuleotomy maybe advantages are superior therapeutic technique terms in the range of motion.

In contrast Filan and Carton[24] analyzing and 9006 consecutive instance with 96.4% for upgrade in the biggest research directly evaluating the unrepared capsulotomies versus the capsular repair 580 of the patients of these cases went into group A no repair and 458 of these cases fill into Group B repair after surgery both groups showed considerable movement in all range of Motion and also it's a Repair Group didn't show any better outcome than the repair capsule on the other hand among the patient aged between 25 and 34 they are considered lower rate of the revision hip arthroscopy when hip capsular repair was performed .In two further studies the patient having revision hip arthroscopy had effect of unrepaired capsulotomy and capsular repair evaluate .[25,26]

in comparison to un repaired the capsluotomies both trials showed that the capsular repair or placation is context of the revision has significant predictor for the better patient reported outcome even though revision hip arthroscopy is separated procedure from the primary surgery the result of this trials seems to indicate the value of capsular repair in revision setting these patients are being seen by hip arthroscopy surgeon more often and more

researchers is required to determine best course of therapy.[27,28,29]

Capsular repair produce better results than unrepaired the capsuleotomy according to the data from the biomechanical studies and the empirical observation but the meta analysis of prospective and comparative studies conducted in 2021 indicated that the difference is not statistically significant enough to support its superiority.[30] In a retrospective study by Atzmon et al.,[31] which followed the patient with normal lateral Center edge angle for the average of three years after surgery and found no difference between the two treatment group in terms of HOS and mHHS According reported finding that were similar to those of the current investigation this assert the regular interporter rcapsular closure is not required following the hip arthroscopy

The majority of the outcome of the capsular management following hip arthroscopy were examined in Acuna et al.,[32] recent systemic mea analysis they came to the conclusions that there are no difference between treatment group in the treatment of the patient's section being the range of motion Resurrection outcome however when examining patient reported outcome indicators they find tendency towards the improved capsular repair there are limitations even when the patient was a pattern are discovered the data where very heterogeneous full of times differ between research and the majority of the status as the reverb 3 and 4 evidence to the name to a few authors concluded that the meter analysis there's an according to be agreed on the capsular treatment [33].

Numerous study have found that the capsular suture shouldn't appear to have any therapeutic benefit with a little impact insufficient outcome.[34] Ekhtiari et al.,[8] claims that there is no evidence of the capsular suture has long-term impact and joined the stability, According to the recent research capsular suture preserve a health of tissue prevent post operative dislocation slows the formation of the heterotrophic ossification and enhance functional results.[9,10] Thaunat et al.,[35] respective investigation on the functional results has complete this year revealed the clear advantage of the capsular soldier and the other hand Nho et al.,[36] assert that are arthroscopic surgery to produce a satisfactory functional result of the full capsular suture is a key component the number of the patient as a result of nature of the investigation had an absence of the additional fact factors that we have affected the patient selection characterization and some of the limitation of this study was exception of modified Haris score the result are also not statistically significant also they might serve a bias as a further study in my case more information further researchers and the rest is needed to get a suitable

Conclusion

The MRI finding from the two trials we reported that the capsule has stored as restored strikland etat [37] carried out as double blinds control studies with 15 by later precipitation president at six weeks only 20% of and reported capsule has continuous capsule was compared of 3% of the restored capsule in 20 weeks follow up MRI showed no changes and the other

At 6 weeks only 20% of unrepaired the capsule had a continuous capsule compared to his 53 percent of the restored capsule a 24 weeks MRI showed no changes on the other hand McCormink et al.,[38] using assemble there's a limited sample report that all patient who were qualified for revision arthroscopy are discovered using MRI had a capsular abnormalities with two of them having full sickness lesion of the capsule Weber, et al.,[39] looked at the MRI of a symptomatic patient who had hip with the capsular repair according to their analysis 92.5% of this capsule will remain closed after one year despite of the lack of the post operative MRI in our investigation one capsule is repaired the group had an effect and has and has found during the revision but all the capsule of none prepare group division were scarred all the way of labrum[40].

Hip capsular abnormalities have been noted in the literature appearing on MRI patient who required the revision surgery following the FAI surgery may exhibit this symptoms Which includes capsules scarring and contraction or complete capsular or ligamentous separation

with or without extra articular flowed extra position [41].

The limitation of the study The study comprises of a retrospective analysis of prospectively collected data, hence the retrospective design constitutes one limitation. The study was possibly underpowered to observe differing complication rates between groups which constitutes a limitation. However, the study was not designed to compare complication rates between the groups and the study was appropriately powered to compare patient-reported outcome scores.

The groups were separated temporally which introduces bias as they were not randomly assigned. The mean follow-up period of the unrepaired capsule group is significantly longer which according to the recent literature should have been manifested in inferior outcome of the unrepaired capsule group. This difference in follow-up time can introduce bias to the study, but, in light of the outcome, this difference, if at all, accentuate the lack of difference in outcome between the groups. The post-operative questionnaires were fulfilled, by a phone survey which may lead to a bias, though some patients.

The joint capsule were contacted at the same period of time and the questions were read verbatim and no paraphrases were allowed. Finally, the pre- and post-operative information was used for the MHHS and HOS questionnaires and not presented individually, which may affect the results and introduce bias. Finally, the limited numbers of cases presented in this study.

In coclusion, Arthroscopic capsular repair, used in conjunction with arthroscopic hip preservation surgery, appears to be safe and did not negatively influence the hip but the use of capsular repair did not show clinically relevant superiority over the use of unrepaired capsulotomy Level of evidences: level III therapeutic case series

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