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Clinical and functional outcome of different modalities of meniscus repair

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Abstract
Meniscus injuries are common results of sports related injuries and motor vehicle accidents current arthroscopic meniscus repair is indicated for management of meniscal tears because of early rehabilitation and return to work, minimal complications.
Present study is hospital based prospective study of 30 cases admitted at P.D.U. Medical College and hospital, Rajkot from 2018 to 2020.commonage group was between 18 to 60 years with mean age of 34.03years, 22 were male and 3 were female. meniscal injury on right knee were 20 cases and left knee were 10.Type of meniscal tear were longitudinal 26 cases,3 cases of radial tear and 1 case of horizontal tear. Meniscal injuries associated with partial ACL Tear were 13 cases, there were 1 cases of associated with loose bodies and lateral meniscus cyst, loose bodies were removed and cyst excised arthroscopically .Average duration of hospital stay was 5 days ranging from 3to 6 days earliest return to activity on average was 5.5 weeks with range of 4 to 6weeeks. There were 1 case of superficial stich infection and 1 of haemarthrosis which resolved on 4thday.intraoperatively 1 case of breakage of instrument but no damage to cartilage or meniscal tissue. All meniscus repair techniques outside in, inside out, and all inside technique combination of all yields comparative clinical and functional outcome and statistically difference of result is not significant. Excellent to good results were in 99.66%cases.

Keywords: Meniscal repair, outside in, inside out, all inside, Hybrid technique.

Introduction
Meniscal injury of the knee joint are common in sportsperson and athletes. Low morbidity and early rehabilitation associated with arthroscopy makes management of meniscal injuries by arthroscopic repair and menisectomy, a highly acceptable procedure.
Tear of meniscus is a rupturing of one or more of the fibro cartilage strips in the knee called menisci. Menisci can be torn during innocuous activities such as walking or squatting. They can also be torn by traumatic force encountered in sports, road traffic accidents or other forms of physical exertion. The traumatic action is most often a twisting movement at the knee while the leg is flexed. In older adults, the meniscus can be damaged following prolonged wear and tear. Acute injuries can lead to displaced tears which can cause mechanical symptoms such as clicking, catching or locking during motion of the knee joint. The joint will be in pain when in use, but when there is no load, the pain goes away.
Tear of medial meniscus can occur as a part of unhappy triad, together with tear of anterior cruciate ligament and medial collateral ligament.
Arthroscopic procedures of knee joint also improves thoroughness of the diagnosis of meniscal injuries, reduced hospital stay and minimizes complications, thereby improving quality of life. Meniscal repair aims to achieve meniscal healing, avoiding the adverse effects of menisectomy. Meniscal repair techniques largely depend on the type of tear, presupposing precise pre-and intra-operative assessment. Successful meniscal repair depends on a healing process, which is based on two fundamental principles: A solid primary fixation, and a biological process of cicatrization, which requires prior abrasion. Fixation uses knotted sutures, whatever the support. The sutures may be non-absorbable (ultra-high-molecular-weight polyethylene: UHMWPE) or with slow absorption (e.g., PDS), to maintain solid fixation throughout the healing process, which takes several months.

Absorbable and non- absorbable anchors, arrows and staples have all been abandoned, due to poor solidity and cartilage impingement. hybrid systems associating suture (usually UHMWPE) and an absorbable or PEEK(polyether ether ketone) anchor, combine the qualities of a minimally invasive implant and biomechanical properties comparable to those achieved with simple suture(considered as the gold-standard).fixation points are close together, every 5 to 7 mm, and preferably vertical rather than oblique or horizontal ; the most resistant part of meniscus is composed of horizontally distributed collagen fibers, so that a vertical suture has a better hold than a horizontal one. Abrasion is an essential step, and consists in abrading the fibrous tissue on the two edges of the meniscus to obtain bleeding tissue that is able to heal over. The objectives of the present study is to compare clinical and functional results of meniscus repair treated with various modalities.

Materials and Method

The prospective study was conducted from 2018 onwards. Sample was taken from patients of P.D.U. Civil Hospital, Rajkot admitted from emergency department and presenting in outpatient department having meniscus injury identified on the basis of clinical examination and MRI findings, the patietns were treated with menisceal repair techniques.

Example

1. Inside out
2. Outside in
3. All inside
4. Hybrid done arthroscopically

Open repair is no longer indicated for vertical lesions, but may still be used in some very particular circumstances, notably in horizontal lesions in young athletes according to the location of injury. Results will be taken from clinical and functional results at 3rd month, 6th month, 9th month and 1 year follow up.

Functional results were obtained on basis of the two follow up parameters:

1. Tegner lysholm knee scoring scale and
2. Tapper and Hoover System

Criteria

Ages Eligible for Study 18
Years to 60 Years Adult)
Sexes Eligible for Study All
Accepts Healthy Volunteers No
Screening Inclusion Criteria:
Subjects of either gender may be eligible for inclusion in the study only if they meet all of the following criteria:
Able and willing to give informed consent by voluntarily providing written informed consent in accordance with governing Institutional Review

Board

- 18 to 60 years of age, inclusive at the time of screening:
- History indicative of meniscal pathology (e.g., pain, mechanical symptoms described as locking, clicking or giving way);
- Physical exam consistent with meniscus tear (e.g., locked joint, joint line tenderness and/or pain on meniscal compression);
- If prior ligament reconstruction, the study knee is clinically stable,
- Preoperative MRI evidence within 6 months consistent with a horizontal/radial/oblique meniscus tear in the symptomatic compartment
- Arthroscopy Inclusion Criteria:
- Age limit:-18 to 60 years
- Consented subjects may be included in the study only if, upon arthroscopic inspection, their meniscal study lesion meets all of the following criteria established by the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS):
- Zone location: circumferential location of tear includes locations within 10mm of the peripheral rim of the meniscus;
- Radial location: any location from anterior to posterior,
- Tear pattern: primarily horizontal or oblique in orientation (not to exceed 45 degrees from horizontal);
- Compartment: either lateral or medial, but not both;

Opposite compartment meniscal tear (if present) limited to the central portion (i.e., Zone 3/"white zone");

- Tear amenable to repair with all suture-based techniques. Screening Exclusion Criteria:
- Subjects will be excluded from the study for any of the following reasons:
- Arthritis in the study knee (Kellgren-Lawrence Grade 3 or higher,
- Body Mass Index (BMI) 235 kg/m2;Previous meniscal repair or meniscectomy of the study meniscus; Unstable knee;
- Malalignment (>5 degrees) of the study knee, based on X-ray within months requiring osteotomy and/or requiring correction
- History of constitutional/systemic inflammatory/arthritic problem or pain condition, history of knee infection, vascular condition of legs, benign neoplasms of knee, hepatitis, HIV, drug/alcohol abuse, tobacco use, cancer
- Expected to undergo any other primary treatment of the knee,
- Any concomitant painful or disabling disease, condition or post- procedure status of either lower extremity that would interfere with evaluation or rehabilitation of the study knee.
- Pregnant or planning to become pregnant in the next 2 years.
- Arthroscopy Exclusion Criteria:
- Subjects will be excluded from the study if their study meniscus lesion meets any of the following criteria at arthroscopy
- Tear pattern: primarily vertical longitudinal in orientation;
- Partial meniscectomy of any portion of the study meniscus extends beyond the central portion (i.e., Zone 3/"white zone");
- Intact or partially intact meniscus tear that, in the opinion of the Investigator, does not require repair;
- Poor meniscal tissue quality such that it will not hold a suture;
- Any portion of the meniscus repair that, in the opinion of the Investigator, is best treated using an implant other than suture;
- Bicompartmental Zone 1/"red zone" and/or Zone 2/"red-white zone" meniscal tears;
- Performance of a significant concomitant procedure

intended as a therapeutic intervention on the study knee;
- Arthritis in the surgical knee (International Cartilage Research Society (ICRS) grade 3b or higher or modified outer bridge Greade 3 or higher.

Selection of the Patients

Patients with clinically suspected menisical injury were admitted thoroughly Examined clinically routine investigation were done and documented. These cases were posted for diagnostic and therapeutic arthroscopy.

Postoperative Care

1. Jones type padded cotton dressing was applied from mid-thigh to ankle for 24-48 hours to gives better compression and haemostasis.
2. During preoperative period isometric quadriceps Exercises are thought to the patients and are begun as soon as the patients recovery from anaesthesia.
3. Patients were allowed to bear full weight on second postoperative day onwards
4. Early active range of motion was also started on second day onwards. Statistics of Surgery
5. After the patients admission surgery was done on next day. All the 30 patients underwent meniscal repair, in one patient meniscal injury was associated witte cyst in lateral meniscus and loose bodies. cyst was excised and insbes we removed arthroscopicaly.
6. Average duration of surgery was around 80 minutes with range of 50 to 90 minutes.
7. Intraoperative Complications

Complication during surgery were is one case instrument breakage and broken instrument was removed arthroscopica

Post-Operative complication

1 case has haemarthrosis and 1 case has superficial stitch infection deep vein thrombosis joint effusion were not encountered.

Time of Discharge - Patients were discharged at an average of 5.5 days with range from 3 to 6 days

Follow Up period - Patients were followed up in the outpatient department at interval of 1 week, 2 weeks, 4 week. After that every month for 6 month Result will be taken from clinical and functional result. Results at 3rd month, 6 months and 9 months and 1 year follow up.

Fig 1: Intra operative Finding and Procedure Technique Bucket handle tear

Discussion

Treatment of Meniscal injuries has evolved from conservative management, open meniscectomy to closed partial arthroscopic meniscectomy and meniscus repair and meniscal transplantation. Arthroscopic meniscal repair has many advantages in the treatment of meniscal injuries .In our study of 30 cases no study has shown statistically significantly data in view of complications and functional outcome .Arthroscopic meniscal repair is the treatment of choice for peripheral longitudinal meniscal tears in young patients. Today ,there are three arthroscopic techniques for meniscus repair; the inside- out and outside-in suturing techniques and the all –inside technique ,which uses biodegradable products and was developed originally by Albrecht-Olsen et al.in 1993.Since then, a plethora of absorbable devices such as arrows ,screws ,and anchors have been developed that allow for all-inside meniscal repair. The use of all –inside meniscal repair system has been increasing dramatically less demanding and easier for the surgeon in comparison with suturing methods. Arthroscopic meniscus repair along with a c l reconstruction in young adults yield good results.

There are three principal techniques: All-inside, and inside out for middle third and postetrior tears, and outside –in for more anterior locations. Inside –out repair isless and less used in Europe, as it involves posterior counter-incision, which may entail neurologic complications, especially in the medial compartment.

Brian T. Sameulsen *et al*. reviewed comparative outcomes of all inside versus Inside Out repair of Bucket handle meniscal tears. Bucket handle meniscal tears continue to represent a significant challenge and meniscal preservation with repair is the preferred option over total or subtotal meniscectomy.

The clinical success rate observed in this series of propensity-matched large bucket-handle meniscal tears was 80% for both all-inside repair and inside-out repair. This demonstrates that satisfactory clinical outcomes are achievable at short-term to midterm follow-up with both inside-out and all-inside repair of bucket-handle meniscal tears in rigorously matched patients with similar meniscal tear patterns. Increasing patient age trended toward a decreased clinical retear rate, independent of the repair technique. Given the similar biomechanical profile between the repair methods, surgeons should utilize the device or technique that allows them to most reliably obtain anatomic reduction. Randomized clinical trials or prospective cohort studies are needed to more completely evaluate the clinical and survival differences between the 2 repair types for bucket-handle meniscal tears.

In a study by Michael E. Hantes, arthroscopic meniscal repair a comparative study between three different surgical techniques outside-in in Inside Out and all inside technique there were no significant differences among the three groups concerning complications according to results arthroscopic meniscal repair with the Inside Out technique seems to be e superior in comparison with other methods because it offers

higher rate of meniscus healing without prolonged operation time.

In a study by by Mike Tengrootenhuysen, long-term outcome after meniscal repair, the study showed the clinical and radiological importance of meniscal repair successful results in the study were associated with younger age and early and repair using inside out technique for the war increase success was seen in meniscal repair was performed in Association with a c l reconstruction.

In a study by Shirish Pathak et al., Functional outcomes of arthroscopic combined anterior cruciate ligament reconstruction and meniscal repair a retrospective analysis arthroscopic meniscal repair along with a c l reconstruction provided predictable high rates of meniscal healing and yielded favourable functional and clinical outcome patient selection remains one of the most important prognostic factors.

In a study by Hiroshi nakayama clinical outcome of meniscus repair for isolated meniscus tear in athletes, indication for isolated meniscal repair in athletes the rate of satisfactory return to Sports was 91.3 percent in total during the follow-up period ranging from 12 to 33 months retailer of the repaired site was encountered in 4 of the 46 knees (8.7%).

In a study by C. Lutz et al., meniscectomy versus meniscal repair 10 years radiological and clinical results in vertical lesions in stable knee, at more than 10 year follow-up functional scores were significantly better with meniscal repair then meniscectomy on all parameters of the the KOOS scale except quality of life functional and radiological scores correlated closely these results show that meniscal repair for vertical regions in stable knees protect against osteoarthritis and is therefore strongly recommended.

In a study by by Brian young outcomes of meniscus repair in children and adolescents meniscus repair in children has shown to demonstrate a healing rate ranging from 33 to 100% with most studies showing a clinical success rate in more than 70% of patients and increased rates of healing were reported with concomitant ACL reconstruction.

In our series 60% of patients had sports related injuries 30% it included motor vehicle accidents and other injuries were 10%. Thus Sports related injuries and motor vehicle accidents the most common causes of meniscal injuries.

Incidence of of type of meniscal tear in our study was 18 cases isolated meniscal tear 7 cases associated partial ACL one case was associated with Loose body is and cyst of lateral meniscus in our study of longitudinal Bucket handle tear 20 cases bleked 7 cases radial tear one case Complex tear one case were found.

Clinical and functional outcome results in our series excellent 60% good 30% 10% were fair. Arthroscopic meniscus repair reduces Hospital stay give early relief of symptoms low morbidity and patient returns to to their work early with minimal complications hence arthroscopic meniscus repair is preferred treatment of choice for management of meniscus injuries.

Table 1: Types of Meniscal Repaired With Different Techniques

S. No.	Types of tears	Repair mechanisms	No. of cases
1	Anterior horn tears	OUTSIDE IN	1
2	Posterior horn tears	ALL INSIDE	3
3	Middle third tears	All Inside + Inside Out	5
4	Bucket Handle tears	Hybr id (All inside, Inside out)	15
5	Bucket Handle tears	Hybrid(All inside, Inside out, outside in)	2
6	Radial tears	All Inside	3
7	Horizontal tears	All Inside	1

Out of 30 cases in our series of meniscal injury 1 case of Anterior Hon tear repaired with outside in technique, 3 cases of Posterior horn tear repaired with All inside technique, 5 cases ot middle third tear repaired with hybrid technique (All inside+inside out), 15 cases of bucket handle tear repaired with hybrid technique (all inside+ inside out), 5cases of bucket handle tear repaired with hybrid technique (all inside +inside out +inside out+outside in), 3 cases of radial tear repaired with All inside technique and 1 case of horizontal tear repaired with all inside technique.

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