Single stage arthroscopically assisted reconstruction of Multiligamentous Knee Injury with autografts.

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ABSTRACT

Objective: To determine the functional outcome of single stage arthroscopically assisted reconstruction of multiligamentous knee injury(MLKI) with autografts.

Methods: This descriptive study was conducted in Orthopaedic Department Liaquat National Hospital and Medical College Karachi from 21st January 2017 to 21st January 2022.All adults patients with multiligamentous knee injury(MLKI) fulfilling the inclusion criteria were treated with arthroscopically assisted single stage surgery utilizing Hamstring and Quadriceps tendon autografts. Post operative functional outcome was assessed with International Knee Documentation Committee scores (IKDC) and Tegner-Lysholm score at six months, one year and two years follow up. The pre surgery and post surgery IKDC and Tegner-Lysholm scores were compared and *P* value was calculated with paired sample-t test. *P* value <0.05 was considered significant.

Results: We operated 35 patients with MLKI. The mean age was 31.62±6.89 years. All the patients were males. Right MLKI was present in 22(62.85%)and left in 13(37.14%). The predominant patterns of MLKI were Anterior cruciate ligament(ACL) and Medial collateral ligament(MCL) tear in 9(25.71%) patients and ACL,PCL and posterolateral corner (PLC) tear in 7(20%) patients. The pre operative mean IKDC score was 39.34±22. At six months the score was 52.34±21,at one year 72.23±10 and at two years 87.88±55.(*P*<0.05).At two years follow the Tegner-Lysholm score was with excellent in 06(17.14%) patients, good in 26(74.28%) and fair in 03(8.57%) patients(*P*<0.05).

Conclusion: Excellent and good functional outcome was achieved with single stage arthroscopically assisted reconstruction of multiligamentous knee injury using autografts.

Keywords: Anterior cruciate ligament, International Knee Documentation Committee, Multiligament, Posterior cruciate ligament, Tegner-Lysholm.

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INTRODUCTION

Multiligamentous knee injury(MLKI) although a rare entity with a frequency of less than 1 per 100,000 hospital admissions is a challenge to treat.[1-4] These injuries are usually sustained due to high energy trauma like road traffic accidents and sports.[5] MLKI is characterized by disruption of two or more ligaments of the knee namely the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), lateral collateral ligament(LCL) and posterolateral corner, medial collateral ligament(MCL) and posteromedial corner.[6,7] MLKI and knee dislocation are often used synonymously.[8,9] The most common pattern of MLKI is tears of ACL with MCL present in 70.5% cases followed by ACL with LCL tears noted in 11.9%[10] Vascular injury is reported in 18% of MLKI,[11] peroneal nerve injury in 40%,[12] meniscal injury in

55% and chondral injury in 48% of patients with MLKI.[13] Although operative treatment of MLKI has demonstrated better functional outcome than non operative, the optimum treatment of MLKI is still conterversial.[14] Controversies also exist regarding early and delayed MLKI surgery, single stage or two stage surgery, repair or reconstruction of torn ligaments and choice of graft.[15]

The objective of our study was to determine the functional outcome of single stage arthroscopically assisted reconstruction of MLKI with autografts.

METHODS

We conducted this descriptive study in Orthopaedic Department Liaquat National Hospital and Medical College Karachi from 21st January 2017 to 21st January 2022.All adults patients with MLKI involving complete tears of two or more of ACL, PCL, MCL (and posteromedial corner) and LCL (and posterolateral corner) presenting/operated after 3 weeks of sustaining the injury were included. Patients with ligament avulsion, open injury, menisci injury, neurovascular injuries, knee fractures and re surgery were excluded. The study was approved by the Institutional Review Board. Informed consent was obtained from all study participants. Complete history and clinical examination was performed. Relevant clinical tests like with Anterior drawer test, Galeazzi sign,Pivot shift test, Lachman test, varus and valgus stress tests were done for MLKI. The diagnosis was confirmed with MRI knee.

Surgical Technique

All MLKI were treated by the same surgical team using same technique of reconstruction in all cases. Patients were given general or spinal anesthesia. This was followed by clinical examination and arthroscopy through a lateral infrapatellar portal with initial intent to confirm our diagnosis and validate our clinical and MRI findings. We used autografts of semi-tendinosus and Gracilis tendons. Single bundle ACL or PCL reconstruction was done in all cases. The Semitendinosus and Gracilis tendons from both knees were utilized when the MCL and one of the two cruciate ligaments were reconstructed.

An incision was made between the adductor tubercle and the patella on the medial aspect of the knee and extended distally to about 8cm from the joint line on the medial aspect of tibia. For reconstructing the ACL/PCL/MCL the ipsilateral and contralateral Semitendinosus and Gracilis muscle and the contralateral Quadriceps tendons were harvested. (Fig I A-E) The ACL was reconstructed using the quadriceps tendon while the hamstring tendon graft was utilized for MCL and PCL reconstruction. Tunnels were then drilled for PCL reconstruction once the required tendons have been harvested. First the PCL tibial tunnel was created using PCL tibial jig and guide wire was passed. Reaming was done till 8mm. PCL femoral tunnel was then prepared with guide wire and reaming was done till 20mm. with the help of bit-pin suture. The tibial tunnel was passed from tibial tunnel to femoral tunnel and then a pre-prepared graft on tightrope RT (Arthrex) tendon was placed inside the tibial and femoral tunnels with a gentle push on tightrope RT. A 20mm graft was placed inside the femoral tunnel. To reconstruct the ACL a femoral tunnel was drilled through the resident ridge on the posterior lateral femoral condyle. A minimum of 20mm reaming was done with an 8mm drill for tendon inside the tunnel. Then a tibial tunnel was created at an angle of 55 degree reaming at the level of the anterior tibial ridge just lateral to the lateral condyle. Suture was passed into the femoral and tibial tunnels and with the help of suture Hamstring tendon on tight rope RT was placed and with the help of gentle tightening to ensured that a minimum of 20mm was placed inside the femoral tunnel.

A 4cm long longitudinal incision on the medial condyle of the femur was made for MCL reconstruction. At the anatomical landmark of MCL on the femur, a minimum 5.5 mm titanium anchor suture was pushed and locked using harvested Gracilis tendon. The tendon was doubled to an equal size with one end being tightened with the anchor suture and left with opposite ends which was used for PCL and MCL ligament reconstruction using 5.5mm titanium suture and placed at the anatomical landmarks.

Post operatively standardized supervised physical therapy sessions were mandatory for all the patients. Gradual mobilization was ensured in all patients starting from 0 to 30 degree knee flexion on 5th post operative day with gradual increase up to 90 degrees as per patient tolerance. Crutch walking was allowed once straight leg raising was achieved usually at 6th week. Full weight bearing was allowed at 8th week onwards. Follow up visits were scheduled at two weeks, four weeks, six weeks and every third months for two years. Functional outcome at six months, one year and two years follow up was assessed with International Knee Documentation Committee scores (IKDC)[16] and Tegner-Lysholm score.[17] The functional outcome was assessed by two senior Orthopaedic consultants who were not part of

the study team.The IKDC score is from 0 to 100.Sever symptoms or lower functional status has lower or 0 score while no symptoms or better functional outcome has higher or 100 score. The Tegner- Lysholm score is interpreted as Excellent(>90 score), Good(84 to 90 score), Fair(65 to 83 score) and Poor(score<60).

The data was analyzed with SPSS version 27.Frequencies and percentages were calculated for qualitative variables while mean and standard deviation was calculated for quantitative variables. The pre surgery and post surgery IKDC and Tegner-Lysholm scores were compared and *P* value was calculated with paired sample-t test. *P* value <0.05 was considered significant. Data was presented in table where necessary.

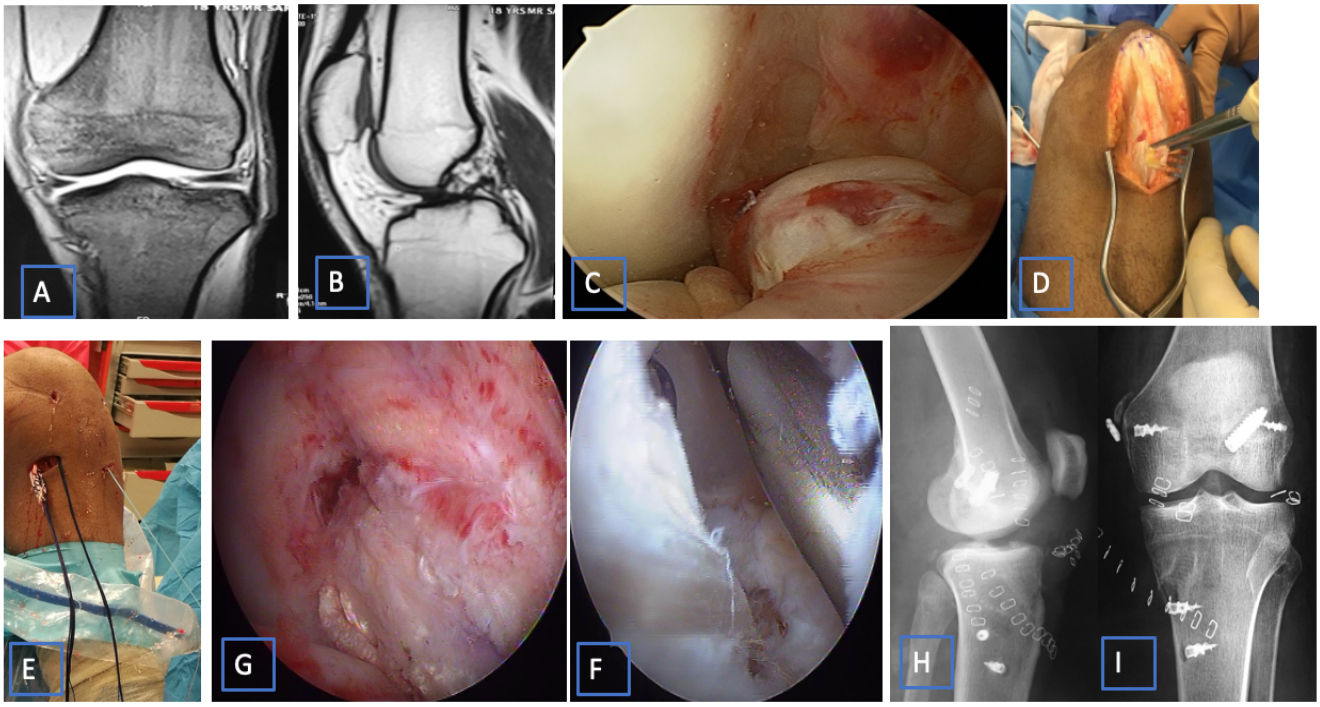

Figure I: A. Coronal view Knee MRI showing MCL Tear **B.** Sagittal view Knee MRI showing torn ACL **C.** Arthroscopic view showing torn ACL **D.** Contralateral Quadriceps tendon Graft harvested **E.** Ipsilateral Hamstring tendon harvested **F.** Passing for Quadricep tendon graft through tunnel for ACL reconstruction **G.** Hamstring Graft passing through tunnel for PCL reconstruction **H.** Post – Operative X – ray shows well placed grafts fixed with endobutton and interferential screw.

RESULTS

In this study 35 patients with MLKI were operated with single stage arthroscopically assisted reconstruction utilizing autografts. The mean age was 31.62±6.89 years. All the patients were males. Right MLKI was noted in 22(62.85%)and left in 13(37.14%). The aetiology of knee injury was road traffic accidents in 18(51.42%),sports injury in 11(31.42%) and fall from height in 6(17.14%) patients. The pattern of MLKI were Anterior cruciate ligament(ACL) and Medial collateral ligament(MCL) tear in 9(25.71%) patients, ACL,PCL and posterolateral corner (PLC) tear in 7(20%) patients, ACL, PCL and MCL in 6(17.14%), ACL and posterior cruciate ligament(PCL) tear in 5(14.28%), ACL,PCL,PLC and MCL tear in 4(11.42%),ACL,PCL and LCL in 2(5.71%), ACL and LCL tear in 2(5.71%) patients. The mean operative time was 150±30 minutes in ACL/MCL reconstruction, 180±30 minutes in MCL/PCL, 120±35 minutes in ACL/PCL, 180±30 minutes in MCL/PCL, 120±35 minutes in ACL/PCL, 180±45 minutes in ACL/PCL/PLC, 210±30 minutes in ACL/PCL/MCL and 240±30 minutes in ACL/PCL/PLC/MCL. The pre operative IKDC score was 39.34±22. At six months the score was 52.34±21,at one year 72.23±10 and at two years 87.88±55.(p<0.05) The mean pre operative Tegner-Lysholm score was 42.60±41. The mean Tegner-Lysholm score at 6 months was 74.25±4.61, at one year 80.05±4.35 and at two years of follow up

87.45±3.27.At two years follow statistically significant improvement(P<0.05) in the score was noted with excellent score in 06(17.14%) patients, good in 26(74.28%) and fair in 03(8.57%) patients.(Table I).We noted superficial skin infection in 3(8.57%) patients and knee stiffness in 2(5.71%) patients which were resolved with antibiotics and manipulation under anaesthesia respectively.

Table I: Functional outcome of our study participants.

Tegner-Lysholm score	Pre operative	Post operative six months	Post operative one year	Post operative two years
Excellent (>90 score).	00	00	05 (14.28%)	06 (17.14%)
Good (84 to 90 score)	00	00	05 (14.28%)	26 (74.28%)
Fair (65 to 83 score)	00	34 (97.14%)	25 (71.42%)	03 (8.57%)
Poor (score<60)	35 (100%)	01 (2.85%)	00	00

DISCUSSION

We treated 35 patients of MLKI with arthroscopically assisted autograft reconstruction and documented excellent and good functional outcome at two years of follow up as evident from statistically significant improvement in IKDC score of 87.88±55 and excellent Tegner-Lysholm score in 06(17.14%) patients, good in 26(74.28%) and fair in 03(8.57%) patients. Literature supports our technique.Ibrahim *et al*[18] treated 20 patients with ACL,PCL and posterolateral corner tears with Gracilis and Semitendinosus autografts. Follow up at 44 months revealed Lysholm score of 90 and excellent results were noted in 6,good in 10,fair in 03 and poor in 01 patient as per Meyers *et al* assessment tool. The IKDC score was nearly normal in 9(45% patients),abnormal in 9(45%) and severely abnormal in 2(10%) patients in his series.Ibrahim *et al* concluded that 80% of his patients had functional stability and good subjective outcome. Fanelli and colleagues[19] treated 19 acute and 16 chronic MLKI. The ligaments tears were ACL/PCL and posterolateral instability in 19 patients, ACL/PCL/MCL in 9, ACL/PCL/MCL and posterolateral instability in 6 and ACL/PCL tear in 1 patient. Bone-patellar tendon bone, Semitendinosus and Gracilis autografts and Achilles tendon allografts were used for reconstruction. A statistically significant (P value 0.001) improvement in post operative functional status was noted as indicated by Lysholm score of 91.2,Tegner score of 5.3 and Hospital for Special Surgery (HSS) knee rating scale of 86.8 at 2 to 10 years follow up. Fanelli concluded that although these knees were not normal but they were functionally stable.

We treated all of our cases of MLKI in a single stage. Literature supports single stage reconstruction of MLKI.[20] Jiang *et al*[21] treated 25 patients of MLKI with arthroscopically assisted single stage autograft and allograft reconstruction. Follow up results at 50.9 months revealed improvement in Lysholm score from pre operative 37.92±3.57 to 87.84±4.85 post operative (**P** value 0.000).The IKDC score was nearly normal in 16(64%) patients, abnormal in 8(32%) and obviously abnormal in 1(4%) patient. Jiang concluded that single stage arthroscopic reconstruction of MLKI is a reliable procedure which can effectively restore knee functions.Chen[22] treated 14 patients of ACL/PCL and MCL with arthroscopically assisted single stage reconstruction and documented a statistically significant improvement(P<0.01) in Lysholm score and IKDC score from 17.00±8.29 and 20.93±8.28 pre operatively to 89.93±6.26 and 88.93±4.82 respectively.

All the patients in our series were treated more than 3 weeks after sustaining MLKI. Li *et al* [23] classified 95 MLKI into emergency(treated <24 hours),acute(treated in the interval extending from 24 hours to 3 weeks) and chronic(treated >3 weeks).Li documented IKDC score of 74.61±12.38, Lysholm score of 81.71±10.80,Tegner score of 3.96±1.14 and VAS score of 1.71±0.60 at 2 years follow up in chronic MLKI reconstruction.

Our study had few limitations. The design of our study was descriptive. Our sample size was small. We utilized only autografts for reconstruction. We were unable to document functional outcome per ligamentous tears. Further studies are therefore recommended to verify our results.

CONCLUSION

Excellent and good functional outcome was achieved with single stage arthroscopically assisted reconstruction of multiligamentous knee injury using autografts. This technique effectively restored knee stability and improves joint mobility. Complete pre operative planning, ideal patient selection and good

surgical expertise however are mandatory for optimum management of MLKI.

Conflict of Interest: None

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