INTRODUCTION

Treatment of knee dislocations remains controversial. There is a paucity of outcome data in the literature which would suggest optimal strategies with regards to timing of fixation, methods of fixation, types of reconstruction, and postoperative rehabilitation. In fact it is not even clear which injury variants should be operated on in the acute setting. Many authors have reported improved outcomes with early surgical repair/reconstruction of all ligamentous structures\textsuperscript{1,2,3,4}.

STAGED PROTOCOL

For complex periarticular knee fractures, several authors have noted the benefits of "staged protocols" for fracture management\textsuperscript{14}. The same principles may have a role in pure knee dislocations. This was the genesis for considering "staged protocols" for knee dislocations.

STAGE 1

After a knee dislocation is reduced, either spontaneously or by manual closed reduction, a thorough neurovascular assessment is performed based on the guidelines above. Most authors agree this initial management should include serial physical examinations, along with measurements of the ankle-brachial index in each patient\textsuperscript{15}. However, controversy exists regarding the use of routine arteriography\textsuperscript{16}. An exam under anesthesia within the first 24-48 hours after injury should be undertaken, along with fluoroscopic stress x-rays with comparison stress X-rays and clinical exam of the contralateral knee to determine the extent of ligamentous injury. If indicated, MRI compatible spanning joint external fixator is placed at that time. Postoperatively a MRI of the knee is performed. At this juncture, anticoagulation treatment should include low molecular weight heparin beginning 12 hours after surgery and continued until definitive fixation.

DVT Prophylaxis

Some form of chemoprophylaxis with or without mechanical measures should be utilized in all of these patients due to the high risk of deep venous thrombosis with these complex injury patterns. Our current protocol is to initiate low molecular weight heparin immediately after determination of injury and after vascular assessment is complete and continue treatment until definitive fixation.

Indications for initial spanning external fixation

2. Gross instability in the anteroposterior (coronal) plane.
3. Inability to tolerate immobilization in a knee brace alone.
STAGE 2
Definitive fixation is based on ligamentous involvement and timing of fixation is based on the status of the soft tissues. When the swelling has subsided, the skin wrinkles, and the abrasions look healed, the skin is amenable to surgical intervention. Our current protocol entails definitive repair/reconstruction of all ligamentous structures typically at 3-6 weeks post injury. This allows a time for soft tissue and inflammatory recovery; however is a short enough interval before extensive fibrosis begins.

CLASSIFICATION
We currently use the classification system described by Wascher which is a modification of the Schenk classification. It is an anatomic classification system which is helpful for research purposes and is fairly descriptive. We find this system helpful as it includes the Knee dislocation type five (KDV) for periarticular fracture dislocations, a significant portion of our practice.

SURGICAL TIMING
Early Versus Delayed Repair/Reconstruction
With regards to timing of the surgery several authors have shown improved outcomes with early versus late surgical repair. Liow et al reported improved outcomes in patients treated with early reconstructions (less than two weeks after injury) as it relates to overall knee function, activity levels, and anterior tibial translation. Wang et al evaluated the outcomes of delayed surgical reconstruction (greater than ten months from injury) for combined posterior cruciate ligament and posterolateral corner injuries and found 32% unsatisfactory results. He recommended early surgical reconstruction for this particular injury pattern. We performed a systematic review and found improved functional and clinical outcomes with early operative treatment compared to non-operative or delayed surgery. Ibrahim conversely reported 87% good and excellent results in a series of 41 traumatic knee dislocations treated acutely with primary reconstruction of the cruciate ligaments and repair of the collateral ligaments. Chhabra et al reported their clinical series of 31 patients, 19 of which were reconstructed acutely (less than three weeks after injury) and 12 patients treated with delayed reconstructions. They found no difference in final knee range of motion between the two groups, however, the group treated acutely had significantly better results with regards to knee stability and subjective scores. Mook et al reported delayed reconstruction could yield equivalent outcomes with regards to stability and that acute surgery is associated with range-of-motion deficits, however, early mobilization results in better outcomes than immobilization.

Current evidence-based medicine (EBM), although limited to a few level III studies, does support early semi-acute surgical management of all damaged ligamentous structures.

SURGICAL TECHNIQUE
Repair versus reconstruct
A hot topic in the treatment of knee dislocations, several authors have shown improved outcomes with acute reconstructions as opposed to ligament repairs. Stannard et al, reported on 63 knee dislocations followed for 2 years and found significantly better results with the reconstructed group, specific to the posterolateral corner. Our series on repair versus reconstruction of the fibular collateral ligament/posterolateral corner also showed a lower rate of failure with reconstruction when compared with repair of these ligaments.

Current evidence-based medicine (EBM), although limited to this level II study, does support posterolateral corner (PLC) reconstruction, as opposed to repair, in the setting of multiligament knee surgery.

GRAFT SELECTION
Allograft Versus Autograft Reconstruction
Stannard et al (16) reported on 15 multiligament knee reconstructions utilizing soft tissue allografts. Fanelli et al (11) reported on a two- to ten-year follow-up of 41 patients utilizing a combination of various allografts and autografts for multiligament knee reconstruction. Talbot et al (17) reported on 21 knee dislocations utilizing all soft tissue allografts.

Satisfactory results have been shown with either allograft and/or autograft reconstructions in this patient population20. In an effort to minimize patient morbidity, it is the authors’ preference to utilize soft tissue allografts for ACL/PCL/PLC reconstructions and semitendinosus gracilis autograft for MCL reconstruction.

Current evidence-based medicine (EBM), although limited to level IV studies, supports the use of allograft and/or autograft reconstruction, in the setting of multiligament knee surgery.

POST OPERATIVE REHABILITATION

Standard rehabilitation protocol/role of external fixation

The postoperative management of knee dislocations remains controversial. Noyes et al7, in their prospective study, reported a 0% incidence of permanent arthrofibrosis and a 0.7% incidence of manipulation under anesthesia to regain knee motion after anterior cruciate ligament reconstructions alone (219 knees) or combined with other procedures (224 knees).

The senior author currently follows the rehabilitation protocols used by Edson et al, Giannoulias et al, and Fanelli et al 8,9,10,11,12,13. This rehab protocol recommends maintaining the knee in full extension for three weeks after multi-ligament knee reconstructions and then beginning progressive knee range of motion. Weight bearing typically begins at six weeks postoperatively with return to sports and heavy labor after nine months. The authors recommend hinged knee brace for up to one year after surgery.

TAKE HOME POINTS

At the present time, there is a paucity of evidence-based medicine, and for the most part, treatment of knee dislocations remains controversial. From initial vascular assessment, to surgical indications, surgical timing, surgical technique, graft selection, and postoperative rehabilitation.

Prospective studies are needed to elucidate whether or not the staged protocols are clearly of merit, and what risks exist with this approach.

BIBLIOGRAPHY


13 Fanelli GC, Edson CJ. Arthroscopically assisted combined anterior and posterior cruciate ligament reconstruction in the multiple ligament injured knee: 2-10 year follow up. Arthroscopy 2002.18(7):703-14


