

Paper #94

Comparing the Efficacy of Kneeling Stress Radiographs and Weighted Gravity Stress Radiographs to Assess Posterior Cruciate Ligament Insufficiency

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Summary:

Weighted gravity PCL stress radiographs should be considered for use in clinical practice as they produce similar posterior tibial translation values to the kneeling technique, do not rely on patient weight-bearing, and provide significantly better patient comfort.

Abstract:

Background

Kneeling stress radiographs are commonly used to evaluate posterior cruciate ligament (PCL) laxity. Patients, however, report significant pain, and reproducibility is challenged due to its dependence on patient body weight distribution to produce posterior tibial displacement (PTD). Weighted gravity stress radiographs may offer better reproducibility and comfort than the kneeling technique, but its efficacy has not been studied. Hypothesis: weighted gravity radiographs will be more comfortable and produce similar PTD measurements when compared to the kneeling technique.

Methods

Patients 18-70 years old with non-operatively or >6 months post-operatively treated PCL injuries (isolated or multi-ligamentous) were recruited from two academic level one trauma centers to undergo bilateral PCL stress radiographs. Exclusions: open/bilateral injuries, fractures. Patients underwent PCL stress radiographs by two randomly ordered methods. Kneeling stress views: patients knelt on padded scales (separate for each knee) with the padding distal to the tibial tubercle. Patients were verbally encouraged to place equal weight on both knees (scale outputs not visible to the patient). A digital radiography plate was placed between the legs to acquire bilateral lateral radiographs. Weighted gravity stress views: Patients lay supine with their hip and knee at 90° with the heel supported. A 20lb weight was placed on the anterior tibia just distal to the tibial tubercle. A lateral radiograph was taken and then repeated on the contralateral leg. Images were anonymized and uploaded to PACS for measurement. Outcomes: side to side difference (SSD) in translation of the posterior tibial condyles relative to the posterior femoral condyles; patient-reported VAS knee pain (100mm); time required to acquire the images; patient preference for technique. Statistics: sample size = 31 patients to detect a 2mm difference ($\alpha=0.05$, power 80%, SD = 2.8mm [Jung, 2006]). Paired t-tests were used to compare the SSD between the kneeling and weighted gravity methods, VAS pain, and time to complete the radiographs.

Results

40 patients (77.5% male, 34.5 ± 12.8yrs old, 65% left knee) were recruited. 42.5% had undergone PCL reconstruction.

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There was no difference between the two radiographic methods in the mean SSD (kneeling = 6.29 ± 4.58 mm, gravity = 6.82 ± 4.60 mm, $p = 0.61$). There was no difference in the total time required to perform the radiographs (kneeling = $307.3s \pm 140.5s$, gravity = $318.7s \pm 151.1s$, $p = 0.73$) or the number of radiographs taken to obtain acceptable images (kneeling = 3.6 ± 1.6 , gravity = 3.7 ± 1.7 , $p = 0.73$). The amount of weight placed on each knee during the kneeling views differed slightly but was not significant (affected = 21.5 ± 11.3 kg, unaffected = 26.1 ± 12.1 kg, $p = 0.09$). There was significantly less knee pain reported for the gravity views (kneeling = 31.8 ± 26.6 , gravity = 4.0 ± 12.0 , $p < 0.0001$). 94.6% of patients preferred the gravity method.

Conclusions

Weighted gravity PCL stress radiographs should be considered for use in clinical practice as they produce similar posterior tibial translation values to the kneeling technique, do not rely on patient weightbearing, and provide significantly better patient comfort.