Detection of Pediatric Traumatic Knee Arthrotomy Using the Saline Load Test

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Background/Purpose: Penetrating joint injuries are important to diagnose early given the risk of septic arthritis. The saline load test (SLT) has been used to detect a traumatic arthrotomy in adults with mixed results. CT scan has also been proposed as a more reliable test than SLT for detecting traumatic arthrotomy. Given the concerns for radiation exposure in children, CT scan may not be an option in the pediatric population. The purpose of this study was to quantify the volume needed for positive diagnosis of arthrotomy in the pediatric knee using SLT.

Methods: After IRB approval, investigators prospectively enrolled patients less than 18 years of age who were scheduled to undergo elective knee arthroscopy. Patients with open injury, active infection, or limited range of motion were excluded. The SLT was performed prior to undergoing planned arthroscopic procedure. The standard superolateral arthroscopic portal was made using 11-blade scalpel, and a 5.0-mm obturator was used to ensure that an arthrotomy had been created. A syringe with 18-gauge needle was inserted into the lateral aspect of the knee and sterile saline was injected at a rate of 5 mL/sec until fluid extravasated from the knee joint. The volume injected was recorded. The 50th, 75th, 90th, and 95th percentiles of saline load volume were identified.

Results: We enrolled 93 patients (50 females, 43 males), with an mean age of 13.5 ± 3.1 years (range, 5-18) and a mean body mass index (BMI) of 21.9 ± 5.6 kg/m^2 (range, 12.9-43.5). Seven patients underwent bilateral surgery, and data were collected on bilateral knees. Mean saline load volume was 26.0 ± 12.5 mL (range, 7.0-72 mL). The 50th, 75th, 90th, and 95th percentiles of saline load volume were 24, 33, 42, and 47 mL, respectively. There was no significant difference in injected volume between males and females (26.3 ± 12.5 vs. 25.5 ± 12.5 mL, $P = 0.686$). Saline load volume was significantly correlated to age, height, weight, and BMI (Table 1).

Conclusion: In order to detect 95% of 1-cm superolateral arthrotomies of the pediatric knee using the SLT, 47 mL must be injected from the lateral aspect of the knee. There is no significant difference between genders. As expected, SLT volume was significantly correlated with child age, height, weight, and BMI.

Table 1. Relationship Between Demographics and Saline Load Volume (Dependent Variable)

Independent Variable	Correlation Coefficient (r)	Regression Equation	Significance (P)
Age (years)	0.35	y = 8.8 + 1.3*x	0.001
Height (cm)	0.33	y = -13.7 + 0.25*x	0.002
Weight (kg)	0.36	y = 14.6 + 0.20*x	0.001
BMI (kg/m^2)	0.28	y = 13.5 + 0.59*x	0.008

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