

ROLE OF MRI AND ARTHROSCOPY IN THE MANAGEMENT OF DISPLACED TIBIAL SPINE AVULSION FRACTURES

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Abstract. Tibial spine avulsion fractures are intra-articular injuries involving the tibial attachment of the anterior cruciate ligament. Treatment decisions depend not only on the degree of fragment displacement but also on associated meniscal injury, soft-tissue entrapment, comminution, ACL integrity, and skeletal maturity. Plain radiographs remain the primary diagnostic method, while MRI improves detection of associated intra-articular lesions. Arthroscopy combines definitive diagnosis with controlled reduction and fixation of displaced fractures.

Keywords: tibial spine, anterior cruciate ligament, avulsion fracture, MRI, arthroscopy, meniscus, suture fixation.

РОЛЬ МРТ И АРТРОСКОПИИ В ЛЕЧЕНИИ СМЕЩЁННЫХ ОТРЫВНЫХ ПЕРЕЛОМОВ МЕЖМЫШЦЕЛКОВОГО ВОЗВЫШЕНИЯ БОЛЬШЕБЕРЦОВОЙ КОСТИ

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Аннотация. Отрывные переломы межмышцелкового возвышения большеберцовой кости представляют собой внутрисуставные повреждения, затрагивающие область тиббиального

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прикрепления передней крестообразной связки. Выбор лечебной тактики определяется не только степенью смещения костного фрагмента, но и наличием сопутствующих повреждений менисков, интерпозиции мягких тканей, многооскольчатого характера перелома, состоянием передней крестообразной связки и степенью скелетной зрелости пациента. Стандартная рентгенография остаётся первичным методом диагностики, тогда как МРТ позволяет более точно выявлять сопутствующие внутрисуставные повреждения. Артроскопия сочетает возможности окончательной диагностики с контролируемой репозицией и фиксацией смещённых костных фрагментов.

Ключевые слова: межмышечковое возвышение большеберцовой кости, передняя крестообразная связка, отрывной перелом, МРТ, артроскопия, мениск, шовная фиксация.

Relevance. Successful treatment of a tibial eminence fracture requires more than radiographic union. Displacement of the ACL insertion may produce residual anterior instability, while meniscal or intermeniscal ligament entrapment may prevent anatomical reduction. These features make accurate preoperative diagnosis and direct intra-articular visualization essential.

Objective. To evaluate the diagnostic value of MRI and the role of arthroscopy in selecting and performing treatment for displaced tibial eminence avulsion fractures.

Materials and Methods. Contemporary systematic reviews and comparative studies addressing imaging, associated intra-articular injuries, and operative fixation of tibial eminence fractures were analyzed.

Results. The modified Meyers–McKeeever classification differentiates nondisplaced type I fractures, hinged type II injuries, completely displaced type III fractures, and comminuted type IV injuries. Type I injuries are generally treated conservatively, whereas types III and IV usually require fixation. Type II fractures require assessment of reducibility and possible soft-tissue interposition. A systematic review of 26 studies found meniscal tears in 18.1% and meniscal or intermeniscal ligament entrapment in 20.1% of pediatric tibial eminence fractures [1]. MRI therefore contributes information that cannot always be obtained from plain radiographs, particularly regarding meniscal, chondral, and ligamentous lesions. Arthroscopy enables direct visualization of the fracture bed and identification of tissue preventing reduction. It also permits simultaneous treatment of meniscal lesions and controlled fixation of the ACL–bone fragment complex. A meta-analysis of 48 studies involving 1367 patients found better anterior stability after arthroscopic compared with open fixation according to anterior drawer and Lachman testing. Suture fixation also demonstrated advantages over screw fixation in several measures of stability and functional outcome [2]. More recent comparison of 412 patients showed no significant differences between screw and suture fixation in Lysholm, Tegner, IKDC, range of motion, KT-1000 results, or union time. Subsequent surgery occurred in 29.75% after screw fixation and 11.6% after suture fixation [3].

Conclusion. MRI complements radiography by identifying associated soft-tissue injury and factors that may prevent successful closed reduction. Its value is particularly high in type II fractures and when conservative treatment is considered. Arthroscopy provides both diagnostic and therapeutic advantages in displaced tibial spine fractures. Direct visualization improves reduction control and allows simultaneous treatment of associated intra-articular pathology. Suture-based fixation is a versatile option for displaced

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and comminuted fractures and reduces the need for hardware-related secondary procedures. Selection of treatment should integrate fracture type, MRI findings, fragment morphology, ACL integrity, and skeletal maturity.

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