

ORIGINAL ARTICLE

**Complications associated with the techniques for
anterior cruciate ligament reconstruction in patients
under 18 years old: A systematic review[☆]**



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KEYWORDS

Techniques
reconstruction;
Anterior cruciate
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Complications

Abstract

Objective: Determine the complications related to the different techniques for anterior cruciate ligament reconstruction in patients under 18 years old.

Methodology: Systematic review using the databases Medline, Cochrane Database of Systematic Reviews and Embase (until July 2016), additional studies were included conducting a search of the references of previous studies. The terms included in the search were: “cruciate”, “ligament”, “anterior”, “immature”, “complications”, “outcome”, “acl reconstruction”, “cruciate ligament anterior reconstruction”, “children”, “child”, “infants”, “adolescent”, “open physis”, “growth plate” and “skeletally immature”.

Results: A number of 73 studies were included; 1300 patients in total, average age 13 years, 70% were male, medial and lateral meniscal lesions in 26% and 30% respectively. Eleven cases of length discrepancy (0.8%): 4 cases were presented with physeal-sparing techniques (1.4%), 3 cases with partial physeal-sparing techniques (2.2%) and 4 cases were presented with transphyseal techniques (0.4%). There were 22 cases of axis deviation: 6 cases with physeal-sparing techniques (2%), 3 cases with partial physeal-sparing techniques and 13 cases with transphyseal techniques (1.4%). The use of allograft Achilles tendon allograft and fascia lata was associated with increased length discrepancy and axis deviation (25%). There was no difference according to Tanner.

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PALABRAS CLAVE

Técnicas de reconstrucción;
Ligamento cruzado anterior;
Esqueleto inmaduro;
Complicaciones

Conclusions: The different anterior cruciate ligament reconstruction techniques in patients under 18 years old had low complications related to lower limb growth, arthrofibrosis and review. There was a higher percentage of cases of length discrepancy and axis deviation with physal-sparing techniques than with the other surgical techniques. The evidence level studies cannot determine causality.

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Complicaciones asociadas a las diferentes técnicas de reconstrucción del ligamento cruzado anterior en menores de 18 años: Revisión sistemática

Resumen

Objetivo: Determinar las complicaciones de las técnicas de reconstrucción de ligamento cruzado anterior en menores de 18 años.

Metodología: Revisión sistemática usando las bases de datos Medline, Cochrane Database of Systematic Reviews y Embase (hasta julio de 2016). Se incluyeron estudios adicionales realizando búsqueda en las referencias bibliográficas de estudios previos. Los términos incluidos fueron «cruciate», «ligament», «anterior», «immature», «complications», «outcome», «ACL reconstruction», «cruciate ligament anterior reconstruction», «children», «child», «infants», «adolescent», «open physis», «growth plate» y «skeletal immature».

Resultados: Estudios incluidos: 73; pacientes: 1.300, con un promedio de edad de 13 años, el 70% eran hombres, con lesiones meniscales mediales en un 26% y laterales en un 30%. Hubo 11 casos de disimetría de longitud (0,8%), de los cuales, 4 se presentaron con las técnicas que respetan la fisis (1,4%), 3 con las técnicas que respetan las fisis parciales (2,2%) y 4 con las técnicas transfisiarias (0,4%). Hubo 22 casos de desviación del eje de la extremidad: 6 con las técnicas que respetan la fisis (2%), 3 con las técnicas que respetan la fisis parcial y 13 con las técnicas transfisiarias (1,4%). El uso de aloinjerto de tendón Aquiles y fascia lata se asoció a mayor presentación de disimetría de longitud y desviación de eje (25%).

Conclusiones: Las técnicas quirúrgicas tienen bajas tasas de complicaciones relacionadas con el crecimiento de los miembros inferiores, artrofibrosis y revisión. Hubo un mayor porcentaje de casos de disimetría de longitud y desviación de eje con las técnicas que respetan las fisis parciales pero, debido al nivel de evidencia de los estudios, no se puede determinar su relación de causalidad.

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Introduction

Anterior cruciate ligament (ACL) injuries are considered rare in skeletally immature patients. However, the incidence has increased in recent years. Dodwell et al. reported an increased incidence in New York from 17 cases per 100,000 inhabitants in 1990 to 50 cases per 100,000 in 2009.¹ Comstock et al. reported an incidence of 14 cases per 100,000 in players of American football.²

Certain intrinsic and extrinsic factors have been considered risk factors for ACL injury. The extrinsic factors include contact sports (football, basketball, skiing), type of footwear and climatic conditions.²⁻⁶

The anatomical conditions include reduced intercondylar groove width, reduced ACL volume, increased posterior femoral and tibial slope, ligament hypermobility, increased Q angle, anterior pelvic slope and femoral anteversion.⁷⁻⁹ There is a higher incidence in females than males by a ratio of 2.9-1, because women have more of the anatomical conditions that predispose to ACL injury.

Luhmann reported an anterior cruciate ligament injury in 29% of patients presenting traumatic joint effusion, while Stanitski et al. reported an injury in 63% of children with haemarthrosis. The incidence of associated meniscal injury is 29%.^{10,11} Krych et al. reported a cure rate of 74% in all types of meniscal injuries after repair.¹²

Prevention strategies for ACL injury using neuromuscular training have shown that a reduction of up to 67% can be achieved in the incidence of tear.¹³

Conservative management of these injuries has been associated with ceasing sporting activities in 50% of cases, with irreparable meniscal and joint cartilage injury observed on MRI and arthroscopy, and the possible development of osteoarthritis.¹⁴

Many surgical management techniques have been described. The risk of growth alterations after ACL reconstruction that perforates the physis has not been established. The femoral distal physis and proximal tibial physis provide 60% of the growth of the lower limb. The femoral distal physis provides 70% of femoral length with a

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