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Original Article

Relationship between peri-incisional dysesthesia and the vertical and oblique incisions on the hamstrings harvest in anterior cruciate ligament reconstruction

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ABSTRACT

Objective: To compare the incidence of peri-incisional dysesthesia according to the skin incision technique for hamstring tendon graft harvest in anterior cruciate ligament reconstruction.

Methods: Thirty-three patients with ACL rupture were separated in two groups: group 1, with 19 patients submitted to the oblique skin incision to access the hamstrings and group 2–14 patients operated by vertical skin incision technique. The selected patients were assessed after surgery. Demographic data and prevalence of dysesthesia was measured by digital pressure around the skin incision and classified according to the Highet scale.

Results: The total rate of dysesthesia was 42% (14 patients). Five patients (26%) on the oblique incision group reported dysesthesia symptoms. On the group submitted to the vertical incision technique, the involvement was 64% (nine patients). On the 33 knees evaluated, the superior lateral area was the most affected skin region, while the superior medial and inferior medial regions were affected in only one patient (7.1%). No statistical differences between both groups were observed regarding patients' weight, age, and height as well as skin incision length.

Conclusion: Patients who underwent reconstruction of the anterior cruciate ligament using the oblique access technique had five times lower incidence of peri-incisional dysesthesia when compared with those in whom the vertical access technique was used.

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Relação da disestesia peri-incisional com os acessos vertical e oblíquo na retirada dos tendões flexores na reconstrução do ligamento cruzado anterior do joelho

Palavras-chave:
Ligamento cruzado anterior
Reconstrução
Disestesia

RESUMO

Objetivo: Comparar a incidência de disestesia peri-incisional de acordo com o tipo de incisão para retirada de enxerto flexor na reconstrução do ligamento cruzado anterior do joelho.
Métodos: Foram divididos em dois grupos 33 pacientes: Grupo 1, composto por 19 pacientes operados pela técnica com incisão oblíqua para o acesso aos flexores, e Grupo 2, composto por 14 pacientes operados pela técnica com incisão vertical. Os pacientes selecionados foram examinados no pós-operatório. Dados demográficos e a prevalência da disestesia foram avaliados por meio de digitopressão em torno da região incisada e a prevalência foi classificada de acordo com a escala de Highet.
Resultados: A taxa total de disestesia foi de 42% (14 pacientes). Cinco pacientes (26%) do grupo da incisão oblíqua apresentaram sintomas de disestesia. No grupo submetido à técnica com incisão vertical, o acometimento foi de 64% (nove pacientes). Nos 33 joelhos avaliados, a região superior-lateral foi a área mais acometida, enquanto as regiões superior-medial e inferior-medial foram afetadas em apenas um paciente (7,1%). Não foram observadas diferenças estatísticas entre os dois grupos em relação ao peso, à idade e à altura dos pacientes, bem como o tamanho da incisão.
Conclusão: Os pacientes submetidos à reconstrução do ligamento cruzado anterior do joelho com a técnica com acesso oblíquo apresentaram incidência de disestesia peri-incisional cinco vezes menor em relação àqueles que foram submetidos à técnica com acesso vertical.

Introduction

Planning an arthroscopic reconstruction of the anterior cruciate ligament (ACL) demands several surgical considerations that may influence its clinical and functional outcomes. Among them, graft options and techniques used to harvest them are noteworthy.[1] The most used autologous graft options include the central third of the patellar tendon, the flexor tendons (semitendinosus and gracilis), and the quadriceps[2]; all have been widely used, and their results and complications are well described in the literature.[1–3] The techniques using grafts from the semitendinosus and gracilis tendons require a small incision and have low donor site mobility.[3] However, due to the particular anatomical location, there is a potential risk of injury to the infrapatellar branch of the saphenous nerve (IPBSN) during harvest,[3] which can lead to complications such as local pain and peri-incisional dysesthesia.[4]

The percentage of peri-incisional dysesthesia in ACL reconstruction with flexor tendons ranges from 14.9% to 77%.[3] Research on the subject addresses preventive measures and comparisons regarding which access would evolve with lower incidence rates of this symptom, which has become a recurring theme in the literature.[2,4–9]

Several authors recommend the use of oblique and horizontal incisions to expose and harvest the tibial insertion of the flexor tendons in order to reduce damage to IPBSN when compared with vertical incisions; however, there is no consensus to date.[3,6–8] It is hypothesized that the incisions with greater respect to the anatomy of IPBSN may ensure a lower complication rate. Therefore, this study aimed to compare the prevalence of peri-incisional dysesthesia according to the type of incision (oblique or vertical) in flexor tendons graft removal for ACL reconstruction.

Material and methods

This cross-sectional study was performed in order to assess the incidence of dysesthesia according to the type of incision in patients undergoing ACL reconstruction using semitendinosus and gracilis tendons grafts. Surgeries were performed by the senior surgeon of the Knee Surgery Group between February 2014 and April 2015. Inclusion criteria comprised all patients who underwent primary ACL reconstruction using an autograft of the flexor tendons. The study excluded patients who had undergone any previous surgery in the region of the studied knee, as well as patients with any peripheral neurological abnormality prior to the procedure. A total of 33 patients were eligible for the study, 26 males and seven females. They were randomly divided by a computer program into two groups; one group comprised 19 patients treated with the oblique incision technique and the other group included 14 patients, in whom the vertical incision technique was used. The following data were recorded: age, height, weight, the presence or absence of peri-incisional dysesthesia, and when present, the location (superior, inferior, lateral, or medial) relative to the incision.[4]

All incisions for graft harvesting were made with a 90 degrees flexed knee, 2 cm below the superior extremity of the anterior tibial tubercle (ATT) and 1 cm medial to it. Vertical incisions were made in a plane parallel to the ATT; the

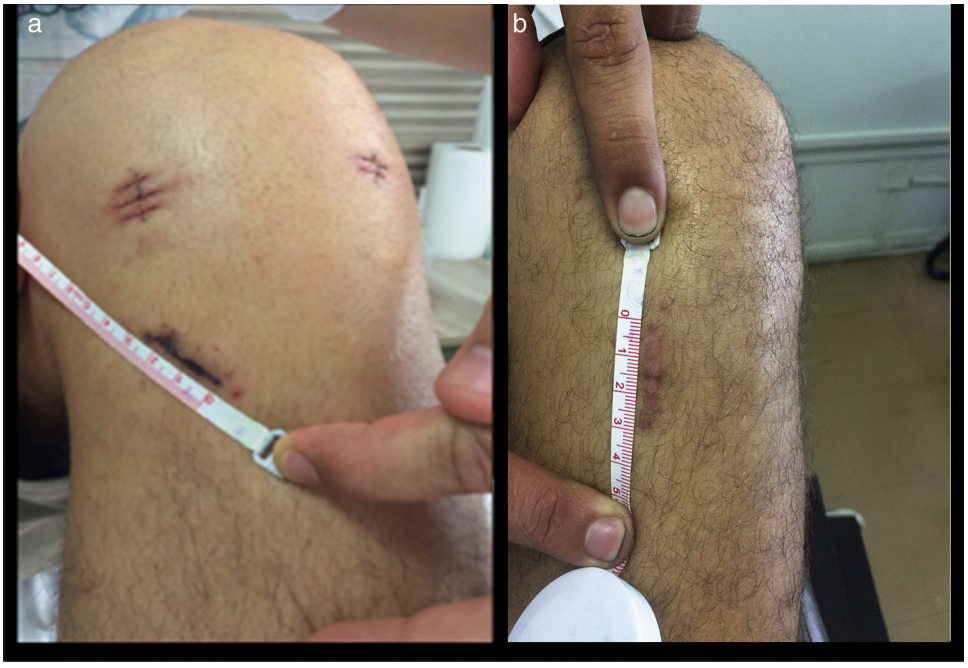

Fig. 1 – Oblique (a) and vertical (b) incision to remove flexor grafts for the reconstruction of the anterior cruciate ligament.

oblique incisions, with an inclination of 45° in relation to this plane, from superomedial to inferolateral (Fig. 1). Mean length of incisions was 3.07 cm for the oblique group (3–3.4 cm) and 3.11 cm for the vertical group (3–3.5 cm). All grafts were prepared in free form. All patients were operated by transportal arthroscopy, which used only two arthroscopic portals. The rehabilitation protocol did not differ between the two groups. Selected patients were examined in an outpatient care facility for postoperative control at 14, 30, 90, 180, and 360 days, when the final assessment of the neurological status was made. Clinical evaluation was performed by a single researcher. The sensitivity of the peri-incisional region was measured by digit pressure and classified according to Highet's scale (S0: anesthesia; S1: deep sensitivity preserved; S2: pain and tactile sensitivity preserved with dysesthesia; S3: pain and tactile sensitivity preserved without dysesthesia; S3+ presence of discriminative sensitivity; S4 normal sensitivity).[10]

The study was approved by the Ethics Committee in Research under the CAAE number 44637715.0.0000.5120; all patients received and signed an informed consent form.

Statistical analysis

A previous sample calculation was performed and the number of 28 knees was defined as necessary for statistical significance (14 in each group), considering a significance level of 5%, 80% test power, and the dysesthesia prevalences reported in the literature. To assess the relationship between the incision technique and the presence of dysesthesia, the chi-squared (χ^2) test for independence was used,[11] with a 5% significance level. The odds ratios were then calculated to assess the probability of the event occurring between groups. All other data were presented as mean and standard deviation. The statistical analyses were performed with SPSS (IBM Corp. Released 2011. IBM SPSS *Statistics for Windows*, Version 20.0. Armonk, NY: IBM Corp.).

Results

Patients' age ranged from 18 to 53 years, with a mean of 34.5 (SD = 9.18). The mean weight of the patients was 72 kg, ranging from 62 kg to 85 kg. Height ranged from 1.62 m to 1.85 m, with a mean of 1.73 m. There was no difference between groups regarding mean age (*ns*), as well as no differences regarding weight, height, and gender of patients.

Oblique incision was used in 19 out of 33 knees assessed. Of these, 14 (74%) had dysesthesia complaints and five (26%) had symptoms during follow-up. Among patients in whom surgery was performed with a vertical incision, five (36%) had no complaints and nine (64%) had some degree of dysesthesia around the incised region during follow-up. According to the odds ratio test, the presence of dysesthesia in patients undergoing vertical incision was five times higher (5.04 times; CI = 95%) than in patients operated with oblique access. All incisions were measured and the greatest difference found was 5 mm, with no statistical difference (ns).

In 33 knees evaluated, the superolateral region was the most affected; superomedial and inferomedial involvement was observed in only one patient (7.1%). Of the 14 patients with dysesthesia, 71.4% had complaints in only one region, three (9.1%) in two, and only one patient complained in three regions (Table 1). All patients with dysesthesia were classified as S2 on Highet's scale.

Discussion

The most important finding of the present study was that the type of incision used to remove the flexor graft in ACL

Table 1 – Prevalence of dysesthesia according to the type of incision to remove the flexor grafts for the reconstruction of the anterior cruciate ligament.

Type of incision	Quadrant	*n*	%
Oblique	Inferolateral	3	60
	Superolateral	2	40
	Superomedial	1	20
	Inferomedial	1	20
Vertical	Inferolateral	5	56
	Superolateral	7	78

reconstruction is decisive for the incidence of postoperative peri-incisional dysesthesia. An overall prevalence of 26% of dysesthesia was observed, five-fold higher in the group with vertical incision in relationship to the oblique incision, perhaps due to greater conformity to the anatomy of the IPBSN in this case.

Gali et al.[3] conducted a study in cadaveric knees and demonstrated that the IPBSN is almost parallel to the superior border of the anserinus tendons (from medial to lateral-superior-inferior). The proximity between these structures, associated with the surface position of its terminal branch in the anteromedial region of the knee, could explain the incidence of iatrogenic IPBSN injuries in ACL reconstruction with flexor tendons, which, according to the literature, can reach 77%.[3,12,13] The consensus among researchers is based precisely on the existence of a parallelism between the horizontal and oblique incisions and the anatomy of the IPBSN. Portland et al.[6] compared three complications associated with vertical and horizontal incisions in the removal of flexor tendon: pain, cosmetic appearance, and dysesthesia. In all assessed items, the vertical incision presented a higher rate of complications. Regarding dysesthesia, those authors observed an incidence of 59% in the vertical incision, *vs.* 43% in horizontal.[6] Papastergiou et al.[9] found similar results. Luo et al.,[8] in a study published in 2007, observed a 24% risk of IPBSN injuries in patients who underwent oblique incision *vs.* 65.7% in those who underwent vertical incision, with no significant difference in follow-up period and the mean age of patients.

Several authors assessed options to minimize the complications during graft harvesting for ACL reconstruction. Letartre et al.[14] suggested a technique that uses the posterior access for removing the flexor tendons in order to prevent lesions in the saphenous nerves and its branches in the anteromedial region of the knee. In a recent publication, De Padua et al.[15] found a lower rate of saphenous nerve lesions in cases where only the semitendinosus tendon was removed (thus preserving the gracile) when compared with harvesting of both grafts. Tifford et al.[7] assessed the effect of IPBSN position on dynamic knee mobility in 20 cadaver knees and concluded that incisions in the anterior aspect of the knee should be made in flexion. In agreement with those authors, all patients in the present study underwent incision with the knee in flexion.

The limitations of the present study are associated with its transversal design, which assessed the presence of dysesthesia over a maximum period of 12 months. This may not represent the actual rate of dysesthesia found in these patients, taking into account the possibility of neurological recovery that can occur in the first two years after surgery.[16] Furthermore, the functional impact in patients with neurological deficit was not measured and, finally, this study did not assess the possible involvement of the saphenous nerve due to the use of a stripper to collect graft, which could perhaps explain the lower rate of dysesthesia, albeit still present, found in the group in which the oblique incision was used.[17,18]

This study is therefore relevant for surgeons who perform this procedure, because a major impact in the prevention of postoperative dysesthesia can be achieved through a small technical change in ACL reconstruction.

Conclusion

In the present study, patients undergoing ACL reconstruction with the technique of oblique access showed a five-fold lower prevalence of peri-incisional dysesthesia when compared with the group in whom the vertical access was used.

Conflicts of interest

The authors declare no conflicts of interest.

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