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Lateral meniscus allograft transplantation with platelet-rich plasma injections: A minimum two-year follow-up study

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ABSTRACT

Background: The aim of this study was to report the short-term clinical and imaging outcomes of lateral meniscus allograft transplantations (LMAT) combined with intra-articular platelet-rich plasma (PRP) injection.
Methods: Thirty-three patients who had undergone LMAT combined with intra-articular PRP injection were evaluated. The Lysholm, International Knee Documentation Committee (IKDC), Western Ontario and McMaster Universities Osteoarthritis Index, Tegner activity level scale and visual analog scale for pain scores were used to evaluate the outcomes. Magnetic resonance imaging scans were performed postoperatively to assess graft position and chondral degeneration/damage.
Results: A total of 31 of the original 33 patients were evaluated over a mean follow-up period of 37.0 months. Patients demonstrated statistically significant improvements in all scoring data from the pre-operative to two-year follow-up period. The mean postoperative extrusion was 1.59 ± 1.20 mm (range 0–3.9 mm). There were no significant differences in the distribution of the grade of chondral damage between the pre-operative and two-year follow-up periods. Three patients (9.7%) showed no improvements or had lower evaluation scores. One patient underwent matrix-induced autologous chondrocyte implantation at one year after LMAT.
Conclusion: Lateral meniscus allograft transplantation combined with intra-articular PRP injection resulted in statistically significant improvements in all functions and pain scores, and clinical improvements in Tegner, IKDC, and Lysholm values during short-term follow-up. A further case–control study with a larger sample size and longer follow-up is required to obtain an overall assessment of the benefits of PRP on MAT patients.
Level of evidence IV.

1. Introduction

Many studies have previously reported on the importance of the biomechanical function of the meniscus [1,2], and the high rate of osteoarthritis (OA) after total or subtotal meniscectomy [3–6]. Although arthroscopic meniscal repair techniques have been modified and improved in recent years, meniscectomy still needs to be performed on patients with insufficient meniscal tissue of sufficient quality for repairing, such as in cases of horizontal cleavage tears and meniscus re-tears. Meniscus allograft transplantation (MAT) – a surgery that aims to decrease patients' symptoms, improve function, and provide knee stability for patients who have undergone meniscectomy – has been performed since the 1980s [7,8].

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One of the primary objectives of reconstructing the load transmission in the tibiofemoral compartment is to prevent or delay onset of knee OA in young people. Moderate to severe radiographic OA is considered to be a relative contraindication for MAT because the efficacy of the chondroprotection of this treatment remains controversial for patients with these radiographic changes [9–12]. Therefore, MAT is suitable for patients with limited cartilage degeneration. However, there are some unavoidable risks of allograft such as immunological rejection and graft disunion. This indicates that the techniques can still be optimized in many ways to avoid reintervention, increase graft survivorship, and delay knee arthroplasty in young patients.

Platelet-rich plasma (PRP) contains growth factors, cytokines, chemokines, dense and lisosomal granules, and anti-inflammatory properties, which are essential for the body's response to injury [13–15]. PRP has been widely used in meniscus tears to enhance tissue repair and reduce inflammation [16–19]; however, no studies have reported the clinical or radiological results of PRP use in patients who have undergone MAT. Although the efficacy of chondroprotection remains controversial, many studies, including multiple randomized controlled trials and meta-analyses, have reported good clinical outcomes of intra-articular PRP injection, especially for younger and more active patients with limited cartilage degeneration [14,20,21]; it has also been proven effective for pain relief and functional improvement [22,23].

The aim of the current study was to report the short-term clinical and radiographic outcomes of lateral meniscus allograft transplantations (LMAT) combined with intra-articular PRP injection. It was hypothesized that patients who undergo total or subtotal meniscectomy will benefit from pain relief and functional improvement as a result of LMAT combined with PRP injection.

2. Materials and methods

2.1. Patients

This retrospective study included patients who underwent LMAT (bone plug technique) combined with intra-articular PRP injection at the study authors' hospital between 2013 and 2015. Inclusion criteria were as follows: (1) unicompartmental knee pain after lateral total/subtotal meniscectomy, (2) aged <50 years, and (3) stability of the involved knee. Exclusion criteria were as follows: (1) mal-ligament or ligament deficiency of the involved knee, (2) diffuse Outerbridge grade IV cartilage damage, (3) local or systemic infections, (4) autoimmune diseases, (5) pregnancy, (6) known malignancy, and (7) bleeding disorder.

2.2. Pre-operative preparation

Before the operation, detailed medical histories and comprehensive physical examinations were obtained for all patients. Radiographs and arthroscopic images of meniscectomy were reviewed when accessible (all patients' data were obtained). Standing antero-posterior, patellofemoral (30° flexion), and standing mechanical axis x-rays were obtained to exclude severe OA and malalignment. Pre-operative magnetic resonance imaging scans (MRIs) were obtained for chondral damage assessment and meniscus sizing [24]. Patients' blood was obtained during surgery, and leukocyte-poor, platelet-rich plasma was derived via a PRP centrifugal machine (WEGO Co., Shandong, China).

2.3. Surgical technique

All patients underwent lateral meniscus allograft transplantation and intra-articular PRP injection performed by the same experienced surgeon (Dr. H. Z.). The allografts were fresh-frozen menisci.

The transplantation used an arthroscopic double bone plug technique, as described by Shelton and Dukes [25]. In this study, the surgeon used a suture hook technique, which is widely performed in arthroscopic rotator cuff repair, to fix the posterior horn instead

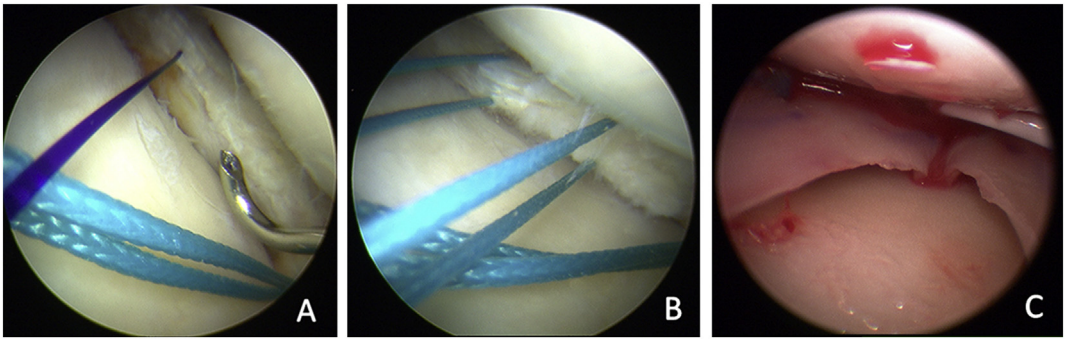

Figure 1. (A) The posterior horn of the host meniscus with part of the posterior lateral capsule was pierced via a suture hook (DePuy Mitek Inc., California, USA), and one end of a PDS suture was fed into the articular though the suture hook. After the other end of the PDS was tied on a suture (Ethibond W4843), which pierced the posterior horn of the graft, (B) the end of the PDS which was in the articular was pulled out of the joint to pass the graft and W4843 in. Lastly, (C) platelet-rich plasma was injected around the allograft in the joint.

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