78698_Auto_Edited - check.docx

WORD COUNT 1063
TIME SUBMITTED 19-SEP-2022 04:42PM
PAPER ID 90654961

Name of Journal: *World Journal of Clinical Cases*

Manuscript NO: 78698

Manuscript Type: CASE REPORT

Repair of a large patellar cartilage defect using human umbilical cord blood-derived mesenchymal stem cells: A case report

Cartilage repair using huMSCs

Jun-Seob Song, Ki-Taek Hong, Ki Jeon Song, Seok Jung Kim

Abstract

BACKGROUND

Patellar dislocation may cause cartilage defects of various sizes. Large defects commonly require surgical treatment; however, conventional treatments are problematic.

CASE SUMMARY

A 15-year-old boy with a large patellar cartilage defect due to patellar dislocation was treated *via* human umbilical cord blood-derived mesenchymal stem cell (hUCB-MSC) implantation. To our knowledge, this is the first report of this treatment for this purpose. The patient recovered well, as indicated by good visual analog scale, International Knee Documentation Committee, and McMaster Universities Osteoarthritis Index scores. Magnetic resonance imaging showed cartilage regeneration 18 mo postoperatively.

CONCLUSION

Umbilical cord blood-derived hUCB-MSCs may be a useful treatment option for the repair of large patellar cartilage defects.

Key Words: Case report; Cartilage defect; Umbilical cord; Mesenchymal stem cells; Patellar dislocation; magnetic resonance imaging

Song JS, Hong KT, Song KJ, Kim SJ. Repair of a large patellar cartilage defect using human umbilical cord blood-derived mesenchymal stem cells: A case report . *World J Clin Cases* 2022; In press

Core Tip: Umbilical cord blood-derived mesenchymal stem cells consist of a unique population of progenitors co-expressing mesenchymal stem cells and neuronal markers capable of instantaneous differentiation. This report is of a 15-year-old male teen with a

large patellar cartilage defect due to patellar dislocation, who was treated with implantation of human umbilical cord blood-derived mesenchymal stem cells (hUCB-MSCs)

INTRODUCTION

Patellar cartilage defects often accompany acute patellar dislocation[1]. Small cartilage defects can be treated conservatively or *via* microfracture. Large cartilage defects may cause problems, such as anterior knee pain and arthritis, and require cartilage repair treatment.

Treatment of large patellar cartilage defects *via* autologous chondrocyte implantation (ACI) or osteochondral autologous transplantation (OAT) has been reported[1,2]. ACI, a two-step procedure, is time-consuming and expensive, and OAT can cause problems at the harvest site of the osteochondral plug. To avoid these shortcomings, alternative treatment methods, especially those using mesenchymal stem cells (MSCs), have been evaluated recently[3].

We use human umbilical cord blood-derived MSCs (hUCB-MSCs) for cartilage repair. Compared with other MSCs, hUCB-MSCs have better cell activity and do not require invasive procedures for collection. Regardless of the cartilage defect size, the desired amount of the hUCB-MSCs can be prepared at any time[4,5].

To the best of our knowledge, there have been no reports of large patellar cartilage defects treated with hUCB-MSCs. This report presents such a case.

CASE PRESENTATION

Chief complaints

left knee pain and swelling.

History of present illness

A 15-year-old boy had fallen while running the day before.

History of past illness

None

Personal and family history

None

Physical examination

Swelling and limitation of knee motion.

Laboratory examinations

None specific findings

Imaging examinations

Radiography showed patellar dislocation. Magnetic resonance imaging (MRI) revealed a large amount of hemarthrosis, a medial patellofemoral ligament tear, and a 4.92 cm^2 (2.04 × 2.41 cm) patellar cartilage defect **(Figures 1a, b)**.

FINAL DIAGNOSIS

Patellar dislocation with large patellar cartilage defects.

TREATMENT

After routine arthroscopy for loose body removal and joint debridement, a skin incision was made along the medial side of the patella. The cartilage defect site was exposed *via* a 4-cm longitudinal arthrotomy **(Figure 3a)**. Multiple holes were made in the patellar subchondral bone using a -mm drill bit **(Figure 3b)**, and CARTISTEM was injected **(Figure 2c)**. Subsequently, medial patellofemoral ligament repair was performed.

OUTCOME AND FOLLOW-UP

The patient was required to rest while wearing a knee brace for 3 days postoperatively. On postoperative day 4, he began performing a range of motion exercises using a continuous passive motion machine, quadriceps strengthening exercises, and ankle pump exercises. On postoperative day 7, full weight-bearing walking with a hinged knee brace was permitted.

Cartilage regeneration was observed on follow-up MRI 2 years postoperatively **(Figure 1c, d)**. Comparison of the International Knee Documentation Committee) score, the visual analog scale score, and the McMaster Universities Osteoarthritis Index score before and 2 years after surgery indicated improvement, from 5.7 to 90.8, 8 to 2, and 74 to 3, respectively **(Figure 4)**.

DISCUSSION

Patellar cartilage defects are frequently associated with trauma-induced acute patellar dislocation. In the report by Nomura *et al*., 95% (37/39) of knees with acute patellar dislocation had patellar cartilage defects. The treatment of large patellar cartilage defects is challenging.[6] Using ACI, Vasiliadis *et al*. achieved satisfactory results in 92 patients with patellar or trochlear cartilage damage (mean size of the defect: 5.5 cm^2, average follow-up time: 12.6 years)[7]. After treatment, these patients had a high level of activity based on the Tegner score. Grachitelli *et al*. reported a survival rate of 78.1% at 5 and 10 years after osteochondral allograft transplantation in 27 patients (28 knees) with patellar cartilage defects; eight knees (28.6%) showed allograft failure[1].

Despite their effectiveness, ACI and osteochondral transplantation are not without drawbacks: ACI is performed in two steps and can cause graft hypertrophy, and OAT can negatively impact the osteochondral plug harvest site and cause complications such as osteonecrosis[3]. Many studies have devised methods of restoring cartilage using MSCs to avoid these problems. Although initially extracted from the bone marrow or adipose tissue, MSCs are currently extracted from umbilical cord blood. hUCB-MSCs have several advantages over other types of MSCs. First, hUCB-MSCs are less immunogenic. Owing to the naïve nature of a newborn's immune system, they do not

require a close human leukocyte antigen match and thus can escape host immune surveillance. Therefore, they can be used regardless of sex, allergies, and blood group. Second, they have a high expansion capacity compared with bone marrow-derived MSCs. Third, as an off-the-shelf product, they are readily accessible whenever required[3,5,8].

Treatment of juvenile osteochondral defects, especially large defects, using hUCB-MSCs has been previously reported[3]. Our patient had a large patellar cartilage defect with accompanying acute patellar dislocation. Cartilage regeneration was observed 18 mo after hUCB-MSC implantation, as indicated by MRI findings and clinical scores. To the best of our knowledge, this is the first detailed description of the results of hUCB-MSC treatment of a large patellar cartilage defect with patellar dislocation.

CONCLUSION

hUCB-MSCs are a potential treatment option for large patellar cartilage defects with patellar dislocation. Cultured cell therapy, including stem cells, could be more appropriate for large chondral defects.

78698_Auto_Edited - check.docx

ORIGINALITY REPORT

15%
SIMILARITY INDEX

PRIMARY SOURCES

1	www.wjgnet.com Internet	39 words — 3%
2	Jun-Seob Song, Ki-Taek Hong, Na-Min Kim, Jae-Yub Jung, Han-Soo Park, Yoo-Chang Kim, Asode Ananthram Shetty, Seok Jung Kim. "Allogenic umbilical cord blood-derived mesenchymal stem cells implantation for the treatment of juvenile osteochondritis dissecans of the knee", Journal of Clinical Orthopaedics and Trauma, 2019 Crossref	28 words — 2%
3	f6publishing.blob.core.windows.net Internet	26 words — 2%
4	www.ncbi.nlm.nih.gov Internet	26 words — 2%
5	link.springer.com Internet	25 words — 2%
6	"Clinical Outcome at a Minimum of Five Years After Reconstruction of the Anterior Cruciate Ligament", The Journal of Bone and Joint Surgery, 08/01/2005 Crossref	15 words — 1%
7	Masaki Nagashima, Kenichiro Takeshima, Nobuto Origuchi, Ryo Sasaki, Yoshifumi Okada, Toshiro Otani, Ken Ishii. "Not Using a Tourniquet May Reduce the	12 words — 1%

Incidence of Asymptomatic Deep Venous Thrombosis After ACL Reconstruction: An Observational Study", Orthopaedic Journal of Sports Medicine, 2021

Crossref

EXCLUDE QUOTES	ON	EXCLUDE SOURCES	< 12 WORDS
EXCLUDE BIBLIOGRAPHY	ON	EXCLUDE MATCHES	< 12 WORDS