Joint Arthroplasty With Osteochondral Grafting From the Knee for Posttraumatic or Degenerative Hand Joint Disorders

Narihito Kodama, MD, PhD,* Hiroaki Ueba, MD,* Yoshinori Takemura, MD, PhD,* Mitsuaki Ishida, MD, PhD,† Shinji Imai, MD, PhD,* Yoshitaka Matsusue, MD, PhD*

Purpose To describe the operative procedure and report the clinical outcomes of articular surface reconstruction for various hand joint disorders using autologous osteochondral grafts from the knee.

Methods Ten patients underwent articular surface reconstruction for hand joint disorders with autologous osteochondral grafts from the patellofemoral joint. Mean patient age was 35 years (range, 15−52 y). The patients were followed for an average of 48 months (range, 16−89 mo). Arthroplasty was performed on the metacarpophalangeal joint in 4 cases, and on the proximal interphalangeal joint in 6 cases. The patients' clinical outcomes were evaluated with joint range of motion, visual analog scale (0−10 points), and Disabilities of the Arm, Shoulder, and Hand (DASH) score. Histological examination was performed in 3 cases after surgery.

Results Graft union was confirmed in all cases without radiographic evidence of resorption or necrosis. Follow-up radiographic examinations showed good graft incorporation without signs of osteoarthritis such as joint space narrowing. The finger flexion-extension arc improved significantly from an average of 21° to 61°. The mean visual analog scale also improved significantly from 7.0 to 1.5. The mean total active motion showed a significant improvement from 151° before surgery to 201° after surgery, and the mean DASH score improved significantly from 33 to 12. There were no significant differences for the arc of finger motion and DASH score between metacarpophalangeal and proximal interphalangeal joint disorders or between hemiarthroplasty and total joint arthroplasty. Histological examination revealed viable chondrocytes in the implanted cartilage.

Conclusions Autologous osteochondral grafting from the patellofemoral joint provided satisfactory outcomes and may be a useful option for joint surface reconstruction of traumatic or degenerative hand joint disorders. *(J Hand Surg Am. 2015;40(8):1638−1645.*

Type of study/level of evidence Therapeutic IV.

Key words Osteochondral grafting, hand disorders, cartilage lesions, joint arthroplasty.

*From the *Department of Orthopaedic Surgery, and †Clinical Laboratory Medicine and Division of Diagnostic Pathology, Shiga University of Medical Science, Otsu, Shiga, Japan.*

Received for publication January 14, 2015; accepted in revised form May 18, 2015.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Narihito Kodama, MD, PhD, Department of Orthopaedic Surgery, Shiga University of Medical Science, Seta Tsukinowa, Otsu, Shiga, 520-2192, Japan; e-mail: koda62@belle.shiga-med.ac.jp.

0363-5023/15/4008-0017$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2015.05.014

ARTICULAR DAMAGE OF THE HAND joints can be caused by various factors including arthritis, infection, direct trauma to cartilage, and secondary osteoarthritis after injury. Such problems are a common cause of chronic pain and limited joint motion with potentially severe daily life disturbance. Various surgical treatments include partial or complete joint arthrodesis[1−3] and total joint arthroplasty.[4−6] However, these treatment options have several disadvantages such as limited motion of the joint or loosening of

TABLE 1. Patients' Demographic Data

Case	Age (y)	Sex	Disease	Involved Joint	Dominance	Follow-Up (mo)	Additional Treatment
1	17	M	OA after trauma	PIP	ND	89	Screw removal
2	19	M	OD due to trauma	PIP	ND	74	Tenolysis
3	42	M	OD due to trauma	PIP	ND	62	None
4	48	M	OA after trauma	PIP	D	57	None
5	48	F	Idiopathic OA	PIP	ND	52	Tenolysis
6	33	M	OA after trauma	PIP	D	18	None
7	26	F	OA due to Dieterich	MCP	D	47	None
8	15	M	OD due to trauma	MCP	D	38	Screw removal
9	52	M	OA due to gout	MCP	D	26	None
10	46	M	OD due to trauma	MCP	ND	16	None

D, dominance; Dieterich, avascular necrosis of the metacarpal head; ND, nondominance; OA, osteoarthritis; OA after trauma, osteoarthritis after fracture dislocation of the PIP joint; OD due to trauma, osteochondral defects due to trauma.

the prosthesis, and optimal treatment remains controversial. If possible, restoration of the normal hyaline cartilage is often the aim of surgical treatment. Osteochondral grafting with grafts harvested from the rib has been reported for finger joint repair to preserve the joints with reconstruction of the articular surface.[7–9] Several authors have reported that a costal osteochondral graft is a preferred source of grafting material for reconstruction of hand cartilage disorders in order to avoid invasion of other joints.[8,9]

Conversely, autologous osteochondral mosaicplasty from the patellofemoral joint has been described as a viable treatment alternative for osteochondral defects of the knee, ankle, and elbow,[10–13] providing hyaline repair of articular cartilage defects. Non–weight-bearing areas on the patellofemoral joint are most frequently selected as donor sites, and harvesting the graft is technically simple.[11–13] Thus, this procedure may also be applicable to joint surface reconstruction for fingers.

The purpose of this study was to present the technique of articular surface reconstruction by osteochondral grafting from the patellofemoral joint for posttraumatic or degenerative hand joint disorders and to evaluate the clinical outcomes of this procedure.

MATERIALS AND METHODS

The present study was undertaken after receiving approval from our institutional review board. We retrospectively reviewed the clinical and radiological outcomes of 10 patients (mean age, 35 y; range, 15–52 y) who underwent reconstruction of the articular surface for posttraumatic or degenerative hand joint disorders with autologous osteochondral grafting from the patellofemoral joint between 2007 and 2012. All patients had their surgery by the first author (N.K). Patients were contacted and brought into the clinic for evaluation at a mean follow-up of 48 months (range, 16–89 mo). Patient demographics are shown in Table 1. Four patients had metacarpophalangeal (MCP) joint disorders and 6 had disorders of the proximal interphalangeal (PIP) joint. Disorders of the MCP joint were avascular necrosis of the metacarpal head, traumatic osteochondral defect (more than half of the articular surface), and secondary osteoarthritis caused by gout. Disorders of the PIP joint were idiopathic osteoarthritis, traumatic osteochondral defect (more than half of the articular surface), and secondary osteoarthritis due to trauma. Hemiarthroplasty or total

FIGURE 1: The osteochondral graft was inserted into the metacarpal head. The cartilage and bone were trimmed to obtain joint congruity.