

A Case Report of Arthroscopic and Histological Long-Term Evaluation after Resection Interposition Knee Arthroplasty with Chromicized Autogenous Fascia Lata (J-K Membrane)

Go OMORI¹, YOSHIO Koga², Sachu KONO³ and Noriaki YAMAMOTO¹

¹Department of Orthopaedic Surgery, Niigata University School of Medicine, ²Orthopaedic Surgery, Niigata Kobari Hospital, Niigata, ³Orthopaedic Surgery, Hamamatsu Seirei Hospital, Hamamatsu, Japan

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Summary. We report here what we believe to be the first case of a patient who had arthroscopic and histological examinations forty-two years after resection interposition knee arthroplasty with the chromicized autogenous fascia lata (J-K (Jinnaka-Kono) membrane). Arthroscopic examination showed the concave tibial surface had adapted to the convex femoral surface. Although only exposed eburnate bone was seen on this articulation, meniscus-like tissue was observed around the rim of the concave tibial surface. Histological findings of the femoral surface showed well differentiated lamellar bone and fatty marrow without cartilage, and meniscus-like tissue which had the features of fibrous cartilage. The results of this case report support our observations about the biological significance of this procedure, which, we think, still has a place in arthroplasty of the ankylosis or severely destroyed knee joint, especially in young patients.

Key words—knee, resection interposition arthroplasty, chromicized autogenous fascia lata, arthroscopic and histological evaluation.

INTRODUCTION

Surgical treatment for ankylosis or severe contracture of the knee joint secondary to tuberculosis or suppurative arthritis especially in young patients is difficult, and controversy still exists about the procedure. Resection interposition arthroplasty has been one surgical option for such destroyed knee joints.¹⁻³⁾

In 1918, Baer reported the results of resection

interposition arthroplasty using a chromicized pig bladder as an interposition membrane.⁴⁾ Although the Baer membrane gave good pain relief and restoration of the joint motion, severe local reaction often caused complications such as fever, delayed wound healing or sinus formation. In order to decrease such local reactions to the Baer membrane, Jinnaka and Kono developed chromicized autogenous fascia lata for the interposition material, which was called the "J-K (Jinnaka-Kono) membrane"; they introduced this material into resection interposition knee arthroplasty in 1943.⁵⁾

Their surgical procedure was as follows. The subcutaneous tissue was exposed with the Textor incision. Osteotomy of the tibial tuberosity was done to free the quadriceps mechanism and the patellae was retracted proximally. The contracted knee joint was carefully opened by meticulous release of the fibrous scar tissue. The femoral bone end was trimmed close to its normal contour and the tibial end was trimmed flat. The end of the femur was fully covered with a previously prepared J-K membrane and sutured to the femoral ridge. The detached tibial tuberosity was fixed with staples. Physiotherapy, including range-of motion and quadriceps exercise, was started three weeks post-operatively.

Between 1951 and 1975, 28 patients with stiff knees underwent resection interposition arthroplasty using the J-K membrane at Niigata University Hospital. Koga reported satisfactory clinical results from this group with a mean follow-up of 22 years.⁶⁾ This time we report the first case of a patient who had an arthroscopic and histological examination forty-two years after this procedure for a severely contracted left knee joint due to suppurative arthritis.

Correspondence: Go Omori, Department of Orthopaedic Surgery, Niigata University School of Medicine, Asahimachi 1, Niigata 951, Japan.

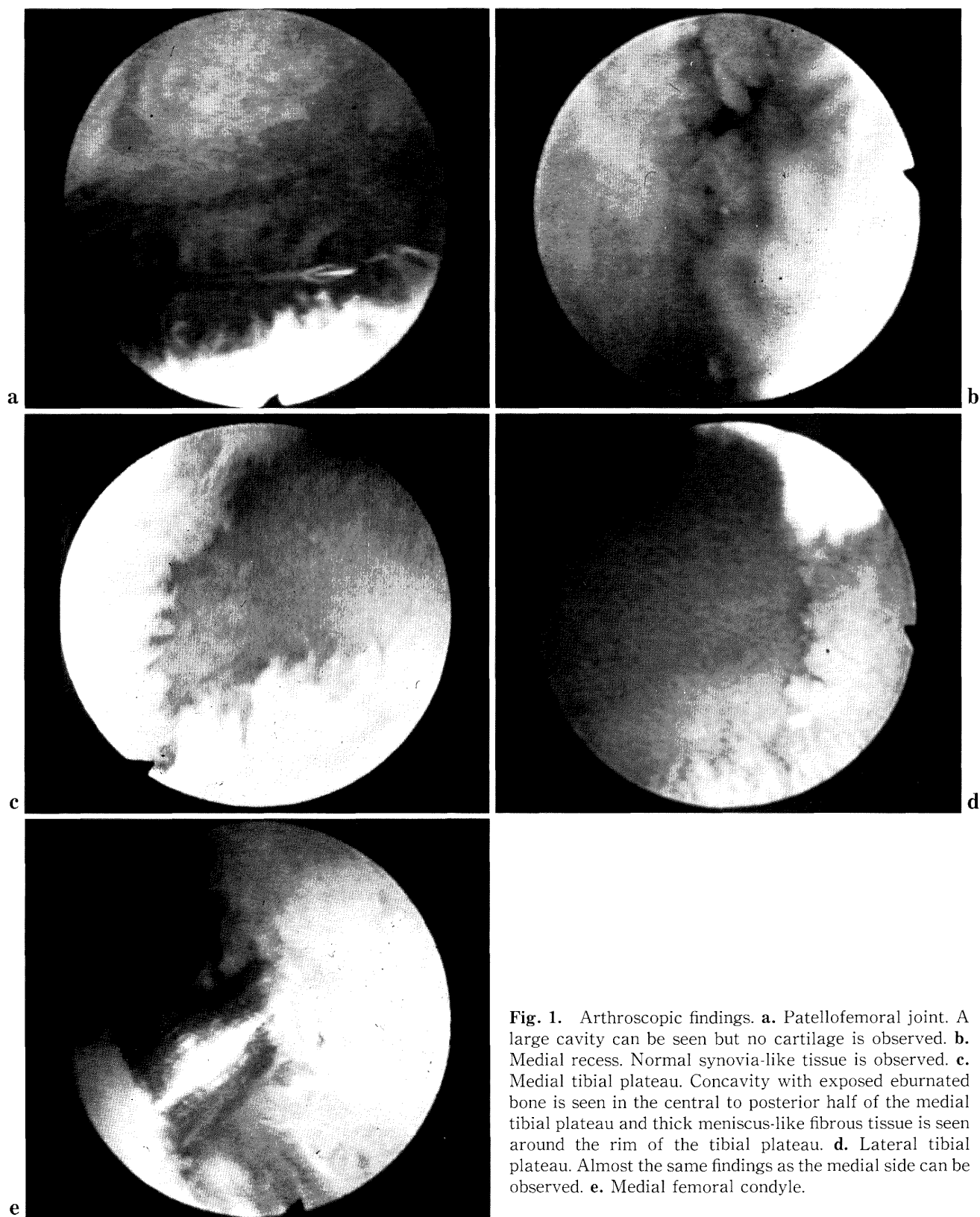


Fig. 1. Arthroscopic findings. **a.** Patellofemoral joint. A large cavity can be seen but no cartilage is observed. **b.** Medial recess. Normal synovia-like tissue is observed. **c.** Medial tibial plateau. Concavity with exposed eburnated bone is seen in the central to posterior half of the medial tibial plateau and thick meniscus-like fibrous tissue is seen around the rim of the tibial plateau. **d.** Lateral tibial plateau. Almost the same findings as the medial side can be observed. **e.** Medial femoral condyle.



Fig. 2. Synovia-like tissue in the medial recess (Specimen-1). HE, $\times 18$ The surface of the tissue is entirely covered with synovial epithelium, and shows the features of almost normal synovial villi.



Fig. 3. a. Thick meniscus-like tissue around the rim of the concave tibial surface (Specimen-2). HE, $\times 18$ **b.** Fibrillated fiber in the intercondylar area (Specimen-3). HE, $\times 18$ Both specimens show features of fibrocartilage with a slight exudation of fibrin material on the surface layer.

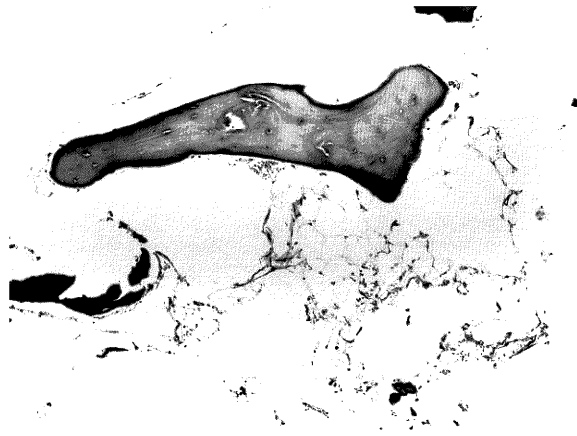


Fig. 4. Femoral surface with exposed eburnate bone (Specimen-4) HE, $\times 18$ Well differentiated normal lamellar bone and fatty marrow without surface cartilage structure can be observed.

CASE REPORT

A sixty-six-year-old man had suppurative arthritis of the left knee joint spread from osteomyelitis of the ipsilateral proximal tibia when he was fifteen-year-old boy. He was first seen in our clinic nine years after the initial infection. His knee joint was severely contracted and active range of motion was -15 degrees of extension and 30 degrees of flexion. Radiographs revealed premature closure of the proximal tibial epiphysis and complete loss of the joint space. Resection interposition arthroplasty using a J-K membrane was performed 3 months after his first clinical visit.

After surgery, the range of motion was regained to full extension and 110 degrees of flexion. He occasionally had mild pain after heavy labor, but not such as necessitated treatment, and worked as a mail carrier for about forty years until retirement. In recent years he has begun feeling slightly increased knee joint pain, so an arthroscopic examination was recommended. At the time of arthroscopy, which was forty-two years after arthroplasty, the range of motion was still restored to -5 degrees of extension to 100 degrees of flexion, and his gait pattern was stable.

Arthroscopic findings

After adequate spinal anesthesia, the joint cavity was filled with approximately 50 ml of normal saline and an arthroscope was inserted through the lateral in-

frapatellar portal. In the patellofemoral compartment a large cavity was observed in the suprapatellar area. No cartilage was seen on the patellar joint surface (Fig. 1a). Normal synovia-like tissue was observed in the medial and lateral recesses (Fig. 1b). In the tibiofemoral compartment no cartilage coverage was seen, but exposed eburnated bone was seen both on the femoral and tibial surfaces. The central to posterior half of the tibial surface was concave; this concave tibial surface seemed to be adapted to the round convex femoral condyle when the knee joint was passively flexed. Meniscus-like fibrous tissue was seen around the rim of the concave tibial surface (Fig. 1c, d and e). The intercondylar space was filled with fibrillated fiber.

Biopsy was performed from the following four spots: 1) synovia-like tissue seen in the medial recess (Specimen-1); 2) thick meniscus-like tissue around the rim of the concave tibial surface (Specimen-2); 3) fibrillated fiber seen in the intercondylar area (Specimen-3); and 4) convex femoral surface with exposed eburnate bone (Specimen-4).

Histological findings

Specimen-1 showed non-neoplastic synovial tissue with papillary structure. The surface of this tissue was entirely covered with a lining of synovial epithelium without stratification. Although there was marked capillary proliferation in the stromal layer, infiltration of the inflammatory cells and fibrosis were not observed. These features were compatible with the almost normal synovial villi (Fig. 2).

Both Specimen-2 and Specimen-3 showed features

of fibrocartilage with a slight exudation of fibrin material on the surface layer. There was no inflammatory change such as inflammatory cell infiltration or capillary proliferation. Synovial epithel covered a part of this fibrocartilage (Fig. 3a, b).

Specimen-4 consisted of well differentiated lamellar bone and fatty marrow without surface cartilage structure. Neither fibrosis nor new bone formation was observed (Fig. 4).

DISCUSSION

Experimental study of the J-K membrane showed that, histologically, the J-K membrane retained its original configuration for 3 to 4 weeks after interposition, formed a large cavity around the membrane, and had low local reaction.⁵⁾ Another histological study of the material taken from the patient, who underwent a second operation 6 months after resection interposition arthroplasty with a J-K membrane, showed that dense collagenous tissue with fibrocartilage could be observed on the joint surface.⁵⁾ Typical radiographic changes that had been followed over the 40 years after this procedure included: 1) concavity of the tibial plateau; 2) a low placed patella; 3) enlargement of the posterior part of the femoral condyle; and 4) circular remodeling of the weight bearing surface. These changes seemed to result from the adaptive remodeling of the bone ends by the monocentric pattern of knee motion, which might help to maintain joint stability over a long period.⁶⁾ From these histological and radiographic findings we have observed the biological significance of the J-K membrane as follows. The interposed J-K membrane produced a large primary joint cavity, after which the J-K membrane was gradually replaced by thick connective tissue and metaplastic fibrous cartilage layer. The regained joint cavity altered its configuration by the above-mentioned adaptive remodeling of the resected end over a long period. This change resulted in wear on the connective tissue and metaplastic fibrous cartilage layer in the weight-bearing area.

In this case, the concave tibial weight bearing surface was adapted to the round convex femoral

surface, and only eburnate bone was seen on these articulations. Furthermore, fibrous cartilage was observed around the rim of the concave tibial surface and synovial epithel was partly seen on this fibrous cartilage. We think the results of the current study represent one piece of evidence that supports our observations.

Although total knee replacement is used as a substitute for arthroplasty these days, this procedure involves several risks such as infection, component breakage, and loosening of the component over a long period. From this point of view, we should pay more attention to the self-restoration ability of the human being. Therefore, we believe that resection interposition arthroplasty with the J-K membrane still has a place in arthroplasty of the knee joint with ankylosis or contracture secondary to tuberculosis or suppurative arthritis or traumatic arthritis, especially in young patients.

A part of this study was presented by the author at the 21st Annual Meeting of the Japan Arthroscopy Association on December 3, 1995 in Tokyo.

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