



## Reconstruction of the Collateral Capsuloligamentous Structures of the Knee after Resection of Soft Tissue Sarcomas using Achilles Tendon Allograft with Bone Block and Gastrocnemius Pedicle Flap

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### Abstract

**Cases:** Two patients after complete removal of the lateral capsuloligamentous structures of the knee joint for soft tissue sarcomas were reconstructed using achilles tendon-bone-block allografts covered with gastrocnemius muscle flap and split skin.

At 14, respectively 6 years follow-up both patients have fully functioning knees without limitations except moderately unsightly scars from the split skin.

**Conclusion:** Reconstruction of collateral capsuloligamentous structures of the knee joint using achilles tendon allograft covered with gastrocnemius muscle flaps appears a valid option after tumor resection avoiding additional morbidity from autologous tendon harvesting.

### Introduction

Extraleisional excision with uncontaminated margins is mandatory for successful treatment of sarcomas. Tumors involving the ligaments respecting the capsule of the knee joint can be addressed by local knee joint sparing resection. Reconstruction of the defect has to consider restoration of stability and soft tissue coverage.

There is extensive literature about reconstruction of the medial and lateral collateral ligaments following injury [1,2]; however because of the rarity of soft tissue sarcomas in general and especially around the knee only few reports deal with these aspects as e.g. [3,4]. The need for ligamentous reconstruction after resection of the proximal fibula has been discussed controversially [5,6].

### Case Series

#### Case 1

The 28 year old woman had an excision of a subcutaneous lump at the lateral knee joint level without prior imaging. Pathologic examination revealed a clear cell sarcoma reaching into the resection margins. Revisional re-excision made resection of a large skin medaillon and the underlying medial collateral ligament and capsule mandatory (Figure 1). The medial collateral ligament was reconstructed with an Achilles tendon allograft. The bone block was fixed to the proximal tibia

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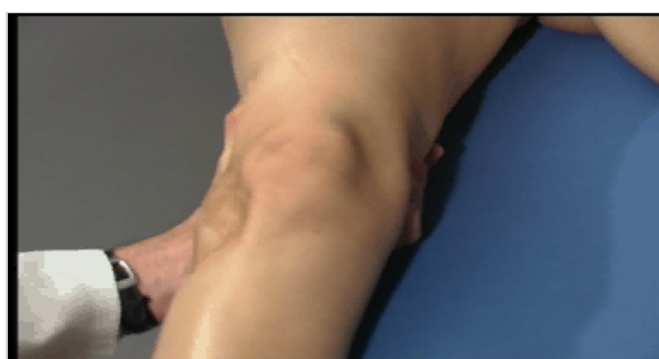
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Video 1: Video of Case 1 at 10 year follow-up demonstrating the stability test.



**Figure 1:** Patient-1 after unplanned excision of a clear cell sarcoma. Skin incision to achieve wide margins at re-excision.



**Figure 2:** Achilles tendon allograft. Screw fixation of the bone block to the proximal fibula. Attachment of the tendon to the fibular head and femur with anchors. Stabilization of the lateral meniscus to the allograft.



**Figure 3:** Elevated lateral gastrocnemius muscle. Fibular nerve marked with a loop.

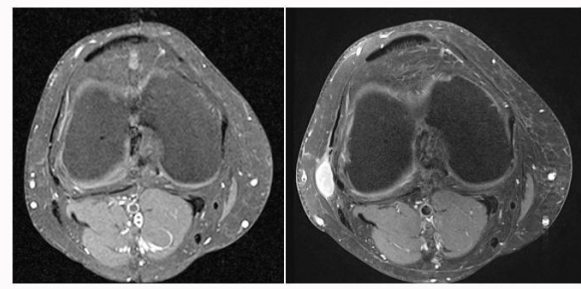


**Figure 4:** The reconstruct is covered with split skin.

with a compression screw, the tendinous part to the proximal fibula and femur with resorbable bone anchors, the meniscus with sutures (Figure 2). For soft tissue reconstruction the lateral gastrocnemius was mobilized (Figure 3) and covered with split skin (Figure 4). The patient is free of recurrence and metastasis at 14 year follow-up (f/u) with a stable knee joint (Video 1). She has adapted to the esthetic aspects of the split skin (Figure 5).



**Figure 5:** Result at 10 years follow-up. Full knee function, moderately disturbing scars.



**Figure 6:** Patient 2, The MRI taken for follow-up 5 years after unplanned excision of a synovial sarcoma shows the recurrence (right May 2012), no signs of recurrence 1.5 years earlier (left December 2010).

## Case 2

The 35 year old patient had an excision assuming a ganglion subcutaneously in the lateral knee region (January 2007). Pathologic examination revealed a biphasic synovial sarcoma with questionably contaminated margins. Following thorough discussion with the patient of different options ranging from local re-resection to amputation the patient refused further surgery but agreed to careful f/u with periodically taken MRI and thoracoabdominal CT-scans. Five years later in May 2012 MRI revealed a lesion suspicious of recurrence (Figure 6). Resection achieved clear margins. Reconstruction was performed similar as in case 1. The bone block was attached to the tibia just ventrally to the tibiofibular joint with screws the ligamentous part of the achilles tendon allograft which was fixed by anchors to the fibular head and femur as in case 1 (Figure 7). The soft tissue defect again was covered with the lateral gastrocnemius muscle and split skin. The screws were removed after 2 years to reduce metallic artifact in the imaging. At 6 years f/u the patient is free of local recurrence and metastases with a stable fully functioning knee joint without any restrictions (Figure 8).



**Figure 7:** X-Ray documentation of the fixation of the allograft with screws to the tibia, anchors to the fibula and femur.



**Figure 8:** Clinical result 5 years after resection of the recurrent synovial sarcoma.

## Discussion

Surgical techniques for the reconstruction of medial collateral ligament injuries have been reviewed recently [1] with 9 publications referring to the use of achilles tendon allografts.

As soft tissue sarcomas account for less than 1% of all malignancies it can be expected, that knee structures are extremely rarely involved. Popov et al. [3] have addressed reconstruction following medial resection using ipsilateral bone-tendon-bone ligamentum patella autograft and soft tissue coverage using a free microvascular flap to avoid functional deficit and donor site morbidity from local gastrocnemius or soleus flaps.

In our both patients presented excellent stability was achieved with the use of achilles tendon allograft, while transposition of the gastrocnemius did not result in reduced strength.

## Conclusion

The reconstruction after resection of lateral capsular knee structures using achilles tendon allograft to restore ligamentous stability and gastrocnemius muscle flaps for soft tissue coverage in the two patients presented revealed excellent results avoiding donor site morbidity, when autologous tendons are harvested. Furthermore the broad achilles tendon allows some readaptation of the patellar retinaculæ.

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