


CASE REPORT

Knee disarticulation
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ABSTRACT

In this paper we presented three patients with knee disarticulation performed according to Baumgartner. The Baumgartner technique and the application of knee disarticulation prosthesis appeared to be superior in comparison with other methods.

Key words: knee, disarticulation, Baumgartner technique

INTRODUCTION

Knee disarticulation is a rarely used method in amputation surgery, primarily due to the operative technique itself and secondly, due to poor understanding of prosthetic replacement possibilities (1). Technological progress and new developments in the prosthetics have opened new possibilities of amputation methods and consequently in the choice of the amputation level (1). A prosthesis for patients with knee disarticulation has been designed, with construction being based on the operative method of knee disarticulation according to Baumgartner (2). The energy expenditure during walking with knee disarticulation prosthesis is a little more than 40%, the same as for below-knee prosthesis (3).

Disarticulation of a knee is recommended for high traumatic amputation of the below-knee, crush injury, complex injuries and tumors of the below-knee (1). Surgeons have been in dilemma between the method of transcondylar amputation and knee disarticulation (2). Knee disarticulation proves to be superior due to the possibilities of prosthetic replacement. The advantages are: a long and strong stump with a tip that can endure full-weight bearing and is suitable for a knee disarticulation prosthesis, the energy expenditure during walking equal to walking with below-knee prosthesis, normal function of the above-knee muscles (2). Unpopularity of knee amputation over many years was caused by bad experience with primary wound healing and the resulting stump of poor quality with regard to its function (2). In order to prevent these complications some surgeons introduced modifications in operative method (4-6). These methods are surgically more demanding and associated with a higher risk of complications (7).

Baumgartner 1971 describes the method of knee disarticulation as a surgically simple procedure that creates a functionally satisfactory stump with regard to further prosthetic fitting (2). The simplicity of the technique is reflected in every aspect - skin, cartilage, bone, muscles (2).

During the last 10 years the Clinic of Traumatology Zagreb has been using the technique of knee disarticulation described by Baumgartner. However, we have introduced some minor modifications. Instead of suturing the patellar ligament as Baumgartner was practising, we cut ligament at the top of the patella. So we additionally increase the contact and weight-bearing surface...
of the stump. These modifications have yielded good results in the application of disarticulation prosthesis for the knee.

Three patients (of different age but with the same successful therapy results) with knee disarticulation performed are presented in this study (Figure 1).

A skin incision is performed in two directions from the outer side of the medial and lateral condyle using an anterior long semicircular incision at 3-5 cm distally below the tibial tuberosity and posteriorly at the level of the sagittal line along the midline of the popliteal fossa – Procedure I. A skin flap is raised and the knee joint exposed. The exposed collateral ligaments and hamstring tendons are resected. The patellar ligament is cut off at the patellar tip. The patella is placed in the position of “patella alta”, which additionally increases the contact and weight-bearing surface of the stump. A transverse wide capsulotomy is done to expose the knee joint with menisci and ACLs that are resected -Procedure II. The knee joint is flexed, the notch is exposed, the PCL is removed and the femoral condyle surface is left intact. Nerves and blood vessels in the popliteal fossa are exposed, ligated and transected. Intact cartilage and femoral condyles are covered with the anterior skin flap which is sutured tension-free to the posterior skin flap in the popliteal fossa – Procedure III. A free drain is placed below the fascia along the entire scar length. The drain is removed after two days and sutures after 14 days.

Case one: A 61-year-old male patient fell under a motor excavator and a distal third of the right below-knee was crushed. Primary amputation at the level of the middle third of the below-knee was performed. The wound was left open and local therapy instituted. Due to complications in terms of bone protrusion on the fibular and tibial stumps, musculo-cutaneous defect and impossibility of wound closure, reamputation at the proximal third level was indicated. Knee disarticulation was done and after the wound healing the patient was admitted to the rehabilitation and fitted with a disarticulation prosthesis. After the prosthetic rehabilitation the patient was able to use the prosthesis during the whole day, walk independently, use a walking cane for longer walks and work on the land.

Case two: A 36-year-old male patient sustained a traumatic amputation of distal third of the right below-knee, and a femoral fracture due to a mine explosion. Transtibial amputation was performed at the level of the proximal third and the right femur was treated by internal fixation according to the AO method. After several months of treatment, the stump was in flexion contracture greater than 30 degrees. Prosthetic fitting was not possible so surgeon recommended the knee disarticulation. After the completed healing of the stump, prosthetic rehabilitation began. Following rehabilitation the patient was able to use the prosthesis for all daily activities and to walk unassisted.

Case three: A 45-year old male patient was injured in a traffic accident as a car driver and sustained an open fracture of the right below-knee. An operative treatment of this complex fracture was attempted but due to infection appearing in the postoperative course the amputation was indicated. The knee disarticulation was performed and prosthetic rehabilitation began (Figure 2). After a rehabilitation the patient wore the prosthesis during the entire day, used a walking cane for longer walks and worked actively.

According to American authors, knee dis-
articular disarticulation is described as a simple, safe operative procedure, which has advantages in the prosthesis application but which is not widely applied (8). Some authors recommend the Mazet and Hennessy as well as the Burgess or Bowker methods (5,9). For those methods it is significant that due to cartilage removal a large bone surface is created, which increases the risk for bleeding and consequently associated complications (5). Thus, the end-bearing of the distal stump portion is significantly reduced. In the prosthetic sense, a disarticulation stump of the knee is obtained and it can accept only an above-knee prosthesis with weight-bearing tuberosity of the ischial bone. This is the very reason for application of those methods only for palliative indications where no prosthesis will be applied because patients will use wheel chairs (8). However, according to the International Society for Prosthetics and Orthotics (ISPO) Consensus Conference on Amputation Surgery 1990, knee disarticulation has an absolutely important place in the practice as an amputation technique (10). It is recommended in younger and elderly patients with indications like trauma, tumors, below-knee infections or circulatory problems in diabetics (11).

Our ten-year experience (150 transcondylar amputations and 15 knee disarticulations) of the application of knee disarticulation as well as the application of the disarticulation prosthesis for the knee shows the advantage of this technique in relation to transcondylar amputation of the femur. Our patients with knee-disarticulation prosthesis showed in average a 50% increase in walking speed in comparison with patients with above-knee prosthesis. Our conclusions are equivalent with results of authors that showed that energy consumption during walk with disarticulation prosthesis was increased by 40% and with the above-knee prosthesis by 70 – 80% (3). The advantages of knee-disarticulation are the simplicity of operative procedures, good quality of stump and successfully application of prosthesis which result in improved quality of life.

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Written consent was obtained from the patient for publication of the Figure 1 and Figure 2.

REFERENCES