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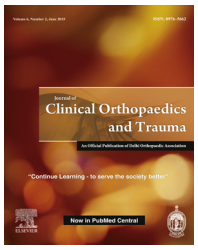

Review Article

Surgical approaches for total knee arthroplasty

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ABSTRACT

There are various surgical approaches to the knee joint and its surrounding structures and such approaches are generally designed to allow the best access to an area of pathology whilst safeguarding important surrounding structures. Controversy currently surrounds the optimal surgical approach for total knee arthroplasty (TKA). The medial parapatellar arthrotomy, or anteromedial approach, has been the most used and has been regarded as the standard approach for exposure of the knee joint. It provides extensive exposure and is useful for open anterior cruciate ligament reconstruction, total knee replacement, and fixation of intra-articular fractures. Because this approach has been implicated in compromise of the patellar circulation, some authors have advocated the subvastus, midvastus, and trivector approaches for exposure of the knee joint. While these approaches expose the knee from the medial side, the anterolateral approach exposes the knee joint from the lateral side. With careful planning and arthrotomy selection, the anterior aspect of the joint can be adequately exposed for TKA in different clinical scenarios.

1. Introduction

Total knee replacement surgery begins with correct planning of both the incision and the exposure of the joint. Indeed, these are factors that are just as crucial to an optimal outcome as choosing the right implant, positioning the components, and balancing the ligaments.

Many knee procedures, nowadays, are routinely performed via arthroscopic or arthroscopic-assisted methods. However, knowledge of open surgical access to the knee remains vital for knee arthroplasty and cases where arthroscopy is not possible or practical. Controversy currently surrounds the optimal surgical approach for total knee arthroplasty (TKA). The best surgical approach in total knee replacement is still to be determined as none of the existing approaches could prove its superiority in previous studies.[1–3]

First described in 1879 by von Langenbeck,[1] the medial parapatellar approach on the inner side of the knee found early favor and it is regarded as the gold standard for which other

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approaches are compared.[1–3] Hofmann reported on the quadriceps preserving subvastus approach in 1991.[2] A compromise between preserving quadriceps function and good surgical exposure was achieved when Engh reported the midvastus approach in 1997.[3] Others employ a lateral approach on the outside of the knee for TKA. Minimally invasive approaches are a more recent development, which aims to reduce damage to soft tissues.

We have reviewed current literature on most commonly used approaches for TKA. Some of the benefits and disadvantages have been discussed with the view to establish the optimal surgical approach for different clinical scenarios in TKA.

1.1. *Anterior skin incisions*

The most commonly used skin incision for primary TKA is an anterior midline incision and has been a utilitarian extensile approach to the knee. The incision should be done with the knee in flexion to allow the subcutaneous tissue to fall medially and laterally, which improves exposure and may obviate the need for raising skin flaps. A straight longitudinal incision beginning 6–12 cm proximal to superior pole of the patella, extending over patella midpoint, and ending at the medial border of tibial tuberosity or approximately 6 cm distal to the inferior pole of the patella; some surgeons prefer to vary the incision with a gentle medial curve over the patella, arguing that the curved incision is less likely to scar and contract (Fig. 1).[4] The extent of the skin incision should be dictated by the requirements of the surgery. The skin incision is deepened through subcutaneous tissues and deep fascia is split in line with the skin incision to develop medial skin flap as thick as possible just superficial to the extensor mechanism to expose the quadriceps tendon, medial border of the patella, and medial border of the patellar tendon. Adequate skin incision reduces degree of skin retraction and lowers risk of tissue necrosis.[5]

If a preexisting anterior scar on the knee is in a usable position, it should be incorporated in the skin incision. Previous TKA skin incision should be used whenever possible. If multiple previous incisions are present, the most lateral usable incision should be selected if possible because the blood supply to the skin of the anterior knee tends to come predominantly from the medial side.

Generally, previous direct medial and lateral incisions and transverse incisions can be ignored. The anterior Kocher U incision[6] and the Putti inverted U incision[7] have become obsolete, primarily because of complications associated with vascular compromise to the surrounding skin. The anterior transverse incision may be cosmetically pleasing, but it does not allow extensile exposure. Cutaneous blood supply may be tenuous in cases of previous surgery (revision TKA) or poor host (rheumatoid, diabetics, chronic steroid/NSAIDs therapy, obesity, and smoking), and hence, more liberal incisions should be used to avoid necrosis from forceful retraction. Skin is supplied by perforating arteries, which run in the muscular fascia, and so any medial or lateral skin flaps (if needed) should be just deep to the fascia to avoid skin necrosis. Old incisions should, as best as possible, be crossed at 90°. Parallel longitudinal incisions are problematic, so maximizing the skin bridge of 5–6 cm is recommended.[8] In case of multiple skin incisions, the most lateral should be selected.

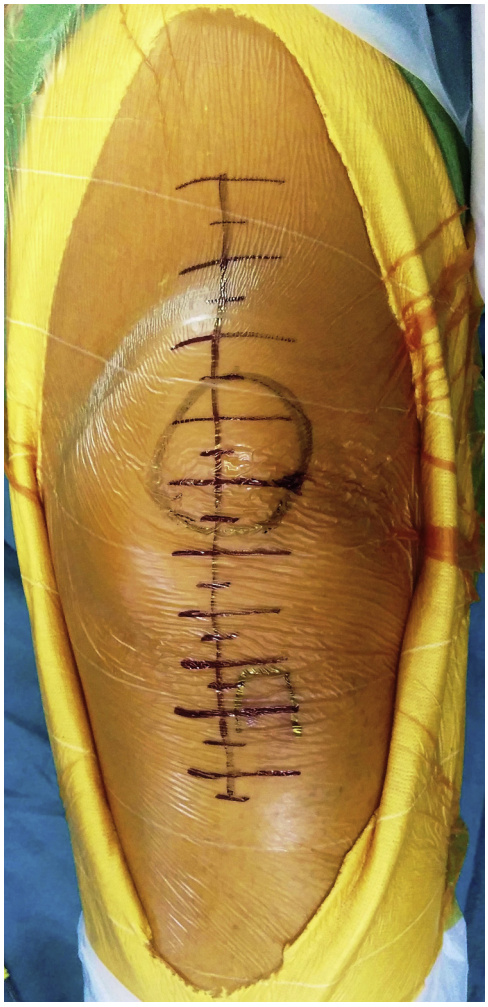

Fig. 1 – Skin incision marked on the skin. Circle represents the patella and the straight line the skin incision. Horizontal lines across the vertical line help in achieving accurate closure.

2. Medial parapatellar approach

Historically, the medial parapatellar approach has been the standard to which other approaches are compared for TKA. As originally described by von Langenbeck in 1878,[1] the approach followed the medial border of the quadriceps tendon, and left a cuff of tissue on the patella on which to repair the medial joint capsule. A standard longitudinal midline skin incision is done as previously described. The parapatellar retinacular incision is extended proximally along the length of the quadriceps tendon, leaving a 3- to 4-mm cuff of tendon on the vastus medialis for later closure (Fig. 2). The incision is continued around the medial side of the patella, extending 3–4 cm on to the antero-medial surface of the tibia along the medial border of the patellar tendon. Medial side of the knee is exposed by subperiosteally elevating the anteromedial capsule and deep