

# SUCTION DRESSINGS IN TOTAL KNEE ARTHROPLASTY - AN ALTERNATIVE TO DEEP SUCTION DRAINAGE

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## ABSTRACT

A new technique is described for dressing of surgical wounds in total knee arthroplasty that is a combination of a semi-permeable film dressing and suction drainage. This technique has been used in 100 consecutive cases and drainage was collected in 92. The average volume was 198 ml (range 30 to 850 ml). There was no superficial or deep sepsis. Haematoma formation causing moderate soft tissue tension and some patient discomfort was noted in 9 knees. This form of post-operative wound management retains the nursing and hygiene advantages of deep suction drainage, whilst avoiding the patient discomfort and potential complication possibilities associated with deep internal drainage.

## INTRODUCTION

Suction drainage is a well-established procedure for removing excessive blood from a surgical wound.<sup>1,4,6,8,10,13,19</sup> It has the theoretical potential of preventing wound infection by removing large volumes of fluid low in opsonins.<sup>1</sup> However, it has the disadvantage of being invasive and in large clinical studies has been associated with a higher rate of wound infection.<sup>14,18</sup> Suction drainage has also been associated with a greater blood loss,<sup>17,19,21</sup> higher incidence of wound problems, is painful, and drains sometimes break on removal.<sup>15</sup> The use of drains has also been questioned after surgery for fractured neck of femur<sup>3</sup> and total hip or total knee replacement.<sup>2,8,17,18,20</sup>

On the other hand, experience has shown that in the absence of suction drains, dressings become blood-soaked, often soiling bedclothes and the patient's night wear. Blood-soaked dressings are not only unsightly but also make it difficult to estimate blood loss.

An attractive alternative to deep suction drainage is an airtight semi-permeable film dressing incorporating a suction tube which removes and collects all blood and exudate from the surface of the wound. This appears to be both hygienic and comfortable to the patient, convenient from the nursing point of view and useful to the clinician in estimating blood loss in the postoperative period. This paper describes the fabrication of the so-called 'suction dressing' and its use in patients undergoing total knee replacement.

## MATERIALS AND METHODS

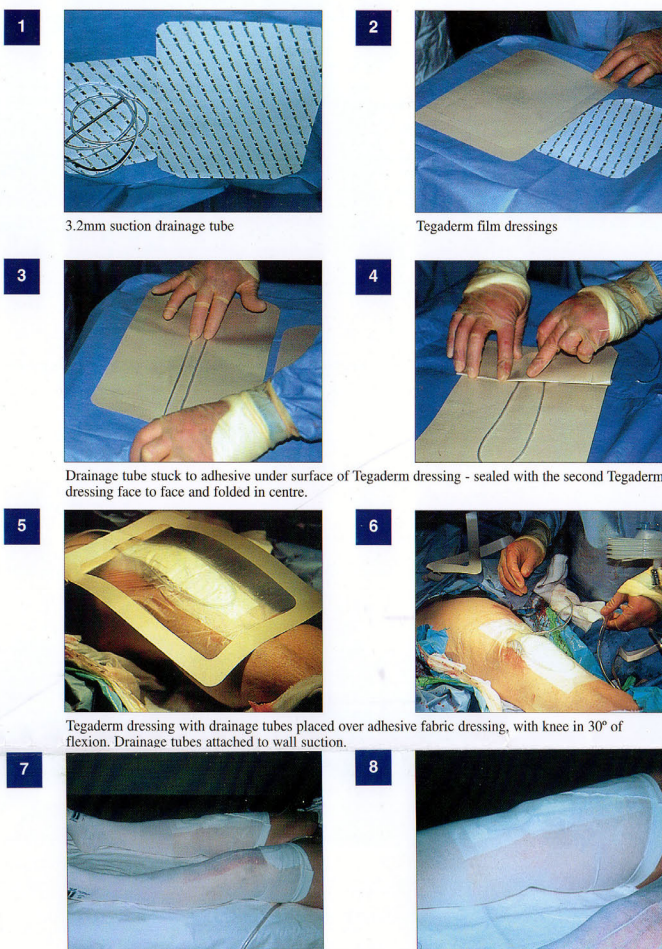
Between September 1992 and January 1995, all patients undergoing a primary total knee replacement by the senior author (A.E.S.) were included in the suction dressing study. There were 100 arthroplasties in 82 patients (11 bilateral, non-simultaneous and 7 bilateral, simultaneous). Primary diagnoses included osteoarthritis in 59 patients (11 bilateral), rheumatoid and other inflammatory arthropathies in 17 patients (7 bilateral) and 6 post-trauma. There were 52 female and 30 male patients with an average age at operation of 65.6 years (range 29-85 years). There were 52 right knees. The Insall-Burstein II posterior stabilised prosthesis (Zimmer, Warsaw, Indiana) was used in 97 cases and the Rotaglide posterior stabilised prosthesis (Corin Medical, Cirencestre, UK) in 3 cases. All operations were performed under general anaesthesia and without the use of a tourniquet. DVT prophylaxis was with mechanical methods only. The knee was exposed through a midline incision, components were cemented in all cases, and the patella was routinely resurfaced. All wounds were closed in layers using continuous absorbent polyacetal sutures and continuous 3/0 subcuticular polyacetal (Vicryl) sutures to the skin. 'Suction dressings' were fabricated at the end of the operative procedure (see Table 1).

Table 1

### Fabrication of the 'Suction Dressing'

The wound is covered with Mepore Adhesive Surgical Dressing (Mölnlycke) with the knee in 30° of flexion. A 20 x 30 cm 3M Tegaderm™ Film Dressing is laid adhesive side up and the adhesive surface is exposed. A 3.2 cm Portovac tube is doubled over and laid down the centre of the Tegaderm dressing so that the perforated region of the tube lies within the confines of the Tegaderm dressing. The adhesive surface on a second 15 x 20 cm Tegaderm film dressing is exposed. The two adhesive dressings are now presented to each other, and stuck together over 5 cms, thus sealing the Portovac tubes. The remaining 10 cm of the second Tegaderm dressing is folded back on itself. The backing card makes the dressing easy to handle. The whole dressing is then applied to the wound over the Mepore dressing, ensuring that the perforated portion of the tube covers the central area of the wound. The backing card is removed, ensuring that the central 'window' area is stuck down before the periphery. Finally, the backing is removed from the periphery completing the 'suction dressing'.

The arrangement of the Tegaderm film dressing, the suction drainage tube and strip of Mepore dressing thus constitutes an airtight composite.



3.2mm suction drainage tube

Tegaderm film dressings

Drainage tube stuck to adhesive under surface of Tegaderm dressing - sealed with the second Tegaderm dressing face to face and folded in centre.

Tegaderm dressing with drainage tubes placed over adhesive fabric dressing, with knee in 30° of flexion. Drainage tubes attached to wall suction.

Elastic anti-thromboembolism stockings applied over dressing. No bulky dressings.

Suction was applied to the suction tube to test the dressing for air-tightness. Wall suction with a sterile collection bottle was applied to the tube of the dressing at a negative pressure of approximately 400 mm of mercury, and continuous suction was applied for approximately 12 hours. Thereafter the drainage tubes were then connected to Portovac vacuum bottles until no suction drainage occurred. The suction dressing was regularly checked for air-tightness and if leakage was detected, an additional semi-permeable film dressing was applied. Continuous passive motion was initiated immediately in the recovery room.

When the dressing was yielding no more blood into the collection bottle, but not later than 48 hours postoperatively, the suction was discontinued and the suction tubes were cut off at their exit from the dressing. The open ends of the tubes were covered with another semi-permeable film dressing. The total drainage from the suction dressing was recorded.

The dressing was left for a total of three or four days or until it became uncomfortable due to the stiffness of the dried blood in the soft cloth fabric, when it was changed to a simple adhesive dressing. Patients were allowed out of bed on the second post-operative day, and could mobilise and exercise as comfortable under the supervision of a physiotherapist. The dressing was changed and the wound was carefully inspected on the third post-operative day and any problems of healing were recorded. Wounds were examined again at subsequent outpatient appointments for any signs of dehiscence or sepsis. All patients were reviewed at three months and one year after surgery.

## RESULTS

Drainage was collected in 92 knees. The average volume was 198 ml (range 30 to 850 ml). In 8 knees no drainage was collected. In 28 knees the suction in the dressing was maintained for 24 hours. In 72 knees it was continued for 48 hours.

There was no superficial or deep sepsis. Minor separation of

the edges of the wound at three days post-operation was observed in 5 knees. Contusion or swelling causing moderate soft tissue tension and some patient discomfort was noted in 9 knees. Minor prolonged oozing of serum occurred in one patient who was seen by his family doctor after discharge from hospital, given antibiotics and his wound healed primarily. Two patients developed minor blisters. Knees with no or only small amounts of drainage did not show higher incidence of wound complications. There was one major wound separation requiring re-suturing in a patient who developed a haematoma, despite 500 ml of drainage.

## DISCUSSION

Despite widespread routine use in orthopaedic surgery, suction drainage remains controversial as the associated risks and benefits are not well defined. In two large multicentre studies conducted by the Public Health Laboratory Services in 1960 and the National Research Council in 1964, drains were found to be independent risk factors for infection, increasing wound infection rates from 5% to 12%.<sup>14,18</sup> Closed suction drains through a separate stab wound were shown to be less likely to cause infection. In 1988, Willett et al studied the efficacy of suction drainage in total hip replacements.<sup>20</sup> Deep suction drains left after 24 hours apparently did not reduce the likelihood of haematoma formation and led in some cases to the spread of skin organisms into the wound. Reilly et al in a retrospective review of total knee replacements with and without suction drains found a higher incidence of wound problems in the group with drains.<sup>17</sup> Besides the danger of acting as a scaffold for infection, suction drains can be trapped within the wound and may break off, leaving behind a section of the drainage tube.<sup>15</sup>

In a prospective randomised trial, Beer et al analysed 50 patients who underwent bilateral simultaneous total hip or total knee replacements with a suction drain placed on only one side.<sup>2</sup> There was no difference between the two sides with regard to wound drainage and circumferential limb swelling. In patients who had total knee replacements, return of active function of the quadriceps and range of motion were also not influenced by the use of drains. In the largest relevant

study, Ritter et al prospectively randomised 275 consecutive total knee and 140 total hip replacements for either suction drainage or no post-operative drainage.<sup>18</sup> They found no differences with respect to the amount of transfused blood, haemoglobin levels and daily range of motion during the first seven post-operative days.

The advantages of the wound dressing are obvious. Because of the lack of internal suction, unnecessary bleeding is avoided. The fabric element in the dressing collects the blood or exudate from the surface of the wound by capillary action. The suction drain removes the excessive fluid from the dressing and collects it in the suction apparatus for measurement. The wound is kept dry and hygienic by the semi-permeable layer of the dressing preventing contamination from external sources. The adhesive nature of the barrier element obviates the need for circumferential dressings or bandages. Blood exuding from the wound into the dressing is successfully and hygienically aspirated into the collection bottle and in cases of excessive drainage, may give an indication for transfusion. Furthermore, the small bulk of the 'suction dressing' allows the immediate application of anti-embolism stockings over it in the operating room. Once the aspiration of blood from the wound has ceased, the suction tube need not be removed from the dressing but can simply be cut off and the open ends sealed by applying a small adhesive dressing. This obviates the necessity for an early change of dressing. The 'suction dressing' technique has become standard post-operative practice in large orthopaedic wounds at the Droitwich Knee Clinic.

### Advantages of the 'Suction Dressing'

- Unnecessary bleeding avoided due to lack of internal suction.
- Fabric element in dressing collects blood or exudate from wound surface by capillary action.
- Suction drain removes excessive fluid from dressing and collects it in suction apparatus for measurement.
- Semi-permeable film keeps wound dry, hygienic and prevents contamination.
- Obviates the need for circumferential dressings or bandages.
- Blood exuding from wound is hygienically aspirated into collection bottle.
- Excessive drainage may give indication for transfusion.
- Small bulk of 'suction dressing' allows immediate application of anti-embolism stockings in operating room.
- Once aspiration and blood from wound has ceased, suction tube need not be removed from dressing but cut off and sealed.
- Obviates the necessity for early dressing change.

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