

## **Uncemented Total Knee Replacement – The Favorable Influence of Low Over High Pressure Drainage**

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### **ABSTRACT**

Post-operative blood loss following uncemented total knee replacement is substantial and can be affected by the vacuum pressure in suction drains. 109 patients undergoing 122 uncemented total knee replacement were monitored to ascertain the influence of high or low vacuum drains on blood loss. Low volume drains produced a statistically significant reduction in blood loss compared to high vacuum drains (mean 1364mls vs. mean 1695mls [ $p < 0.0062$ ]). Our findings reveal that high suction pressure drains are not necessary and may be detrimental when used following uncemented total knee replacement.

### **INTRODUCTION**

Tubular drains made of rigid materials have been in use since the time of Hippocrates. Recordings of his teachings describe the use of hollow tin tubes for draining an empyema (1). During the 17<sup>th</sup> Century tents of lint to prevent wound closure, or for dilating a wound were in popular use (2). The latter part of the 19<sup>th</sup> and early 20<sup>th</sup> centuries saw considerable advances in surgery and improvements in drainage techniques. The soft rubber tube drains introduced by Charles Brigham Penrose and John L. Yates are still in use today (2). Suction drains were first introduced in the middle part of this century and have become universally used in Orthopaedic surgery. Modern drains offer an effective suction system with minimal risk of retrograde bacterial contamination (3), although suction drains have been shown experimentally to increase blood loss (4).

Blood loss following total knee replacement can be substantial and often requires blood transfusion. Berman et al (5) reported an average peri-operative transfusion of 2.6 units. An average blood loss of 1167mls was recorded in 101 cemented knee replacements, although the loss was greater in uncemented replacements. Our study was initiated to assess the effect of low and high vacuum pressure drains on post-operative blood loss following uncemented knee replacement. It was felt that the increased blood loss seen with uncemented prosthesis was related to excessive suction pressure in an incompressible cavity with a large area of exposed cancellous bone.

### **MATERIALS and METHOD**

A prospective review of patients undergoing an uncemented total knee replacement by a single surgeon (MJC). Patients were randomly allocated into two groups, using either a high pressure 'Redovac 800' (Byk Gulden Pharmazeutika) or low pressure 'Drevac' (Astra Pharmaceuticals) vacuum drain. the 'Redovac 800' drain is a pre-vacuumed flask

of 800ml capacity. It has a maximal vacuum pressure of 375mmHg. The 'Drevac' system has compressible bellows of 200mls capacity and a maximum vacuum pressure of 125mmHg. The data on these drains were obtained from the manufacturers.

For both groups the drains were left in-situ until there was less than 20mls in a 12 hour period, and no longer than the third post-operative day. The nursing staff recorded daily tallies of blood loss.

## RESULTS

109 patients underwent 122 uncemented total knee replacements over a 30-month period. Both groups were similar in number, age and sex. No difference in length of hospital stay, wound healing or early post-operative complications was noted between the groups.

*Group 1* consisted of 55 patients in whom 62 knee replacements were performed. 53 patients had osteoarthritis and 2 rheumatoid arthritis. There were 29 females and 26 males with an average age of 68 years.

*Group 2* consisted of 54 patients in whom 60 knee replacements were performed. 48 patients had osteoarthritis and 6 rheumatoid arthritis. There were 30 females and 24 males with an average age of 66 years.

The blood loss in *Group 1* was 1364mls (range 350-2300mls) and in *Group 2* was 1695mls (range 530-4340mls). The difference between the groups was statistically significant ( $p < 0.0062$ ) using the Mann-Whitney test.

## DISCUSSION

Closed suction drainage systems are an effective means of reducing post-operative tissue dead space and haematoma formation thus reducing the risk of possible infection and delayed wound healing (3,4,6,7). High pressure suction systems are useful in the drainage of a compressible cavity such as following a hip arthroplasty. However, high pressure suction applied to an incompressible cavity such as the knee joint with a large exposed surface of cancellous bone may produce excessive blood loss.

Continuous suction drainage remains an optimum means of post-operative wound drainage however little clinical information on its use following total knee replacement is available. Wittman and Ring (8) compared a continuous suction system with an intermittent suction system in 50 patients with uncemented knee replacements and concluded that the intermittent suction system was relatively ineffective, producing inadequate drainage. Reilly et al (1) reviewed 299 cemented total knee replacements in which 170 had post-operative suction drain and 129 had none. The incidence of wound problems was higher in the undrained group (5.8%) compared to the drained group (3%), although this did not reach statistical significance. Other authors (6,7) have also reported increased wound leakage, ecchymosis, erythema and the need for dressing reinforcement when drains were not used.

The advent of suction drainage has been a considerable surgical advance and the advocacy that post-operative drainage is unnecessary (9,10) has received little acceptance. A continuous negative pressure appears most effective at maintaining optimal evacuation of the wound cavity, however, the degree of suction pressure required remains unclear. Our study confirms that increased blood loss is seen with uncemented prosthesis when using high pressure suction, as compared to, low pressure suction drains. High suction pressures are not necessary for effective wound drainage (7,10) and in relation to uncemented total knee replacement may be detrimental.

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