Wound Complications After Hip Surgery Using a Tapeless Compressive Support

Gloria J. Hahn ♦ Dee Grant ♦ Cheryl Bartke
JoLynn McCartin ♦ Ronald M. Carn

Purpose: To compare the incidence of wound complications after hip surgery in patients treated with a compressive spica wrap dressing to those using traditional taping methods.

Design: Retrospective, descriptive, comparative, intervention study.

Sample: 457 hip surgery patients, including primary arthroplasty, revision surgery and fracture with ORIF.

Method: A compressive wrap dressing was used on hip surgery patients in the study group while tape was used on patients in the control group. A retrospective chart review was conducted noting postoperative wound complications.

Findings: There was a significantly lower incidence of blisters and drainage in the study group using a compressive wrap dressing. There was not a higher incidence of DVT or infection using the wrap dressing when compared to published studies.

Conclusion: Use of a compressive wrap dressing after hip surgery is recommended to reduce the risk of wound complications.

Implications for Nursing Research: A prospective, randomized study with multiple surgeons using both compressive wraps and traditional tape techniques would substantiate the advantage of using a hip spica dressing after surgery.

The management of a hip incision is a challenge in the immediate postoperative period. The use of tape in securing postoperative hip dressings can result in development of skin blisters (Blaylock et al., 1995; Fox et al., 1995; Leicht et al., 1995). Securing a dressing without using tape is complicated due to the anatomy of the area. Blisters may result in patient discomfort and increased medical costs. The purpose of this study was to examine the incidence of blisters and wound drainage in patients using a wrap technique for postoperative wound care compared to traditional methods following hip surgery.

The incidence of tape blisters around hip wounds has not been studied until recently. Fox and colleagues (1995) found significant tape blisters occurred in 29% of hip surgery patients, resulting in increased use of nursing care for these patients. Wright (1994) reports similar incidence of blisters (30%) in the postoperative hip population. These results may represent a low estimation of the problem, as Fox et al., report that the pattern of tape usage shifted as surgeons became more cognizant of the blister problem during their data collection.

Leicht et al. (1995) identified blistering as a problem in 60% of hip surgery patients when a nonmeshed adhesive tape was used. The incidence decreased to zero with the use of a meshed multidirectional fabric tape. Blaylock and colleagues (1995) found skin erythema or blistering in 10 of 11 patients using one taping technique. In another group of 12 patients, blisters were eliminated when the type of tape and method of tape application were changed: however, the data were collected only at 24 and 48 hours after surgery.

There are many reasons that blisters may develop under taped areas after hip surgery. Patient factors were reviewed in the article by Milne and colleagues, which precedes this article. Surgical, anatomic, and tape-related issues are discussed there.

Following hip surgery, the vascularity of the skin margins is compromised by the incision, and the hip and thigh swell as a consequence of the surgical trauma, as well as other trauma (e.g., a hip fracture). The muscular envelope of the hip and thigh is the thickest of anywhere in the body. Consequently, the skeletal support of the soft tissue is the farthest from the skin. Due to the hip/pelvis anatomy, a dressing to support the hip cannot be applied without incorporating the waist. Tape cannot truly support the thigh and hip musculature. Lack of soft tissue support results in shear stress deep in the wound, and the subsequent motion at the incised tissue interfaces may result in drainage, hematoma, or infection.

Tape application alters circulation, nutrition, normal bacterial flora, ambient air contact, the evaporation of moisture, and the ability of the skin to stretch with movement (Bryant, 1992).

Another shortcoming of the tape to secure dressings after hip surgery is that shear forces in the dermis compromise the microcirculation and can result in blisters. Because tape must attach to the skin to be effective, and since the forces are tangential to the skin, shear forces are generated with the potential for dermal complications (Bryant, 1988).

In addition to movement causing shear forces, blisters also can develop when the soft tissue areas of the thigh increase in size if the tape is not loosened to accommodate the swelling. External tension separates the epidermal-dermal junction, allowing interstitial fluid to seep into the newly created space to form blisters. To decrease shear, tapes that are flexible and stretch as the skin expands from wound edema and swelling are available; however, it is unlikely that any one tape will match the flexibility of all skin.

Tape application also decreases moisture vapor transmission rate, changing the oxygen gradient at the epidermal level, contributing to adhesive dermatitis (Weber & Stone, 1988). Chemical injury to the skin from adhesive impregnated tape exacerbates the extent of epidermal injury.

The problem of tape can be eliminated by having a wrap to hold the sterile dressing in place. This is easily accomplished in the distal extremities because the anatomy is

amendable to circumferential support. However, the anatomy of the hip and shoulder is not readily supported with the circumferential wrap. The thigh is conical in shape, and the waist is variable in size and shape.

The orthopaedic solution to immobilization of the injured hip is the spica cast. The same principle has been applied to the compressive support of a hip wound. The "spica wrap" not only can provide support for the musculature, adipose, and skin about the hip, but can also be used to hold a sterile dressing in place. This can be accomplished with numerous materials such as rolled elastic wraps or rolled bias cut stockinette.

The spica roll dressing has the advantage that, when applied well, it can conform to a large variety of shapes. Disadvantages include the potential for loosening and loss of support. If not well applied, constriction of the neurovascular structures could occur.

Commercial single-piece stretch fabric hip spica supports are available for the hip surgery patient. These products rely on the flexible fabric conforming to the contours of the patient's body. The ability of the fabric to stretch with swelling is an advantage. These products may have some of the disadvantages of the roll spica dressing if they do not fit well or are improperly applied. Ease of application and a more uniform support are advantages of the stretch fabric hip support. Unfortunately, there have been no studies to document the efficacy of either the roll spica dressing or the commercial hip wrap supports.

Purpose

A wrap technique for postoperative wound care has been used at the investigators' institutions since 1987. The wound complication rate was observed to be low when anecdotally compared to other wound care techniques. The lack of data to help determine optimal wound care prompted this retrospective, comparative, descriptive study of hip surgery patients treated with the wrap technique and patients treated with traditional taping methods. The goal was to determine blister and wound drainage rates for patients with compressive wraps after hip surgery compared to patients with traditional taping methods.

In addition, the incidence of thrombophlebitis (a factor that theoretically could complicate a circumferential wrap about the proximal thigh, hip and waist) was examined and compared to recent studies of thrombotic disease after hip surgery.

Method

Subjects

A total of 499 hip surgeries in 457 patients at private hospitals were reviewed. The parameters examined were demographics, wound drainage, tape blisters, infections, blood loss, wound hematoma, surgical time, deep vein thrombosis, and pulmonary embolism.

The wrap group consisted of 368 patients who underwent 410 consecutive surgeries over a 10-year time period (1988 through 1997), and were all performed by one surgeon.

The patients' average age was 65 years with a range from 19 to 97 years. The pathology contributing to surgery was 60% osteoarthritis, 22% fracture, and 8% rheumatoid arthritis. Other diseases included osteonecrosis, congenitally dislocated hips, Reiter syndrome and Legg-Perthes disease. The 36% male to 64% female ratio reflects the age of the population studied.

The operations performed were 273 primary hip replacements (67%), including 37 bipolar hip replacements, 104 revision hip replacements (25%), and 33 open reduction and internal fixation (ORIF) of the hip fractures (8%). First time hip replacement blood loss averaged 404 ml, revision surgery blood loss averaged 860 ml, and fracture blood loss averaged 273 ml. The overall blood loss averaged 505 ml. The operative time averaged 201 minutes for the revision surgery, 119 minutes for first-time hip replacement, and 74 minutes for fracture surgery. The average operative time was 136 minutes.

The wrap patients were monitored for thrombotic disease. Prior to discharge from the hospital, the patients had a duplex ultrasound of both of their lower extremities to rule out deep vein thrombosis. Clinical signs for pulmonary embolism were also monitored, and if symptoms occurred, the appropriate studies were performed.

Eighty-nine consecutive hip surgeries similar to the wrap group were compared as a control group. These surgeries were done at the same institution by a number of different surgeons during 1994. All dressings had been taped in place and these patients' charts were retrospectively studied for documentation of the presence of blisters and drainage.

In the control group, the average patient age was 75 years (12-95 years), with 23% males and 77% females. Fractures contributed to 74% of the surgeries, 19% were done for osteoarthritis, 5% for osteonecrosis, and 2% for rheumatoid arthritis.

Surgeries in the control group consisted of 27 primary hip replacements (30%), 24 revision surgeries (27%), and 38 ORIF/hip pinnings (43%). Average blood loss was comparable for each procedure. (see Table 1). Operative time was not collected on control study patients.

Table 1
Clinical Characteristics of Patients

	Wrap Group	**Control Group**
No. of Patients	140	89
Average Age (years)	65	75
Gender	36/64 36% male; 64% female	23/77 23% male; 77% female
Type of Surgery		
Primary	273 (67%)	27 (30%)
Revision	104 (25%)	24 (27%)
ORIF	33 (8%)	38 (43%)

Materials

Description of Roll Spica Dressing

Cotton stockinette materials can be cut on a bias to improve the conforming characteristics. The first 70 cases used approximately five yards of 8-inch-wide bias-cut stockinette. In the operating room, an "untaped" sterile dressing was placed on the incision and a thigh/hip/spica wrap was then applied. This was rolled for ease of application and storage. Tape was placed over the fabric (not on the skin) to keep the roll dressing from bunching or shifting upon itself. The tape was not placed circumferentially, but in longitudinal strips to allow the spica wrap to stretch with swelling or motion of the hip.

Description of Single-Piece Spica Wrap

A commercially available single-piece stretch spica wrap (SunMedica, Inc. of Redding, CA) was used on 340 patients in the latter part of the study in place of the roll stockinette. The commercial wrap was made of a four-way stretch cotton-lycra fabric. This allows it to conform to the contours of the patient. The hook and loop attachments allow quick application and access for wound examination and dressing changes.

Procedure

At the beginning of the study, the wrap was removed after 2 days for wound examination by the surgeon. The wounds became more swollen and erythematous when the wrap was removed early.

Reapplication of a compressive support resulted in improvement of the swelling and wound erythema. Unfortunately, this was not documented well enough to be quantified. The wrap was subsequently left in place 5 to 7 days, with daily wound checks by the surgeon. Many patients liked the extra support and wore the wrap for many weeks after surgery.

The roll bias-cut stockinette was not very conducive to wound examination because it had to be removed and reapplied, but the commercial wrap made dressing changes very easy. The posterior approach was used for most of the surgeries, and most were closed with a subcuticular absorbable suture. Drains were left in place for 2 days, and incisions and neurovascular status were checked an average of twice a day.

Revision cases were often closed with metal clips. In these cases, the spica wrap was used to hold a dressing over the clips until the clips were removed (10-14 days).

Wrap group patients were closely monitored for the development of blisters and/or DVT, with the presence of either being immediately recorded on a special sheet placed in the chart for purpose of this study. Data from these sheets were then prospectively reviewed.

Results

Four patients (1%) in the wrap group developed wound blisters. Two were from surgical incision adhesive strips, and two were from inadvertently taping the dressing after

discontinuation of the wrap dressing. None of the four patients with blisters developed infection.

Twenty-eight patients (7%) were noted to have wound drainage. An attempt to quantify wound drainage was not very successful, as the retrospective review of chart data didn't lend itself to quantitative analysis. All drainage was described as a slight to moderate, and none of the wounds had drainage at the time of discharge from the hospital. There were not superficial wound infections in the wrap group.

Thirteen patients (15%) of the control group had documented tape blisters, and 31 (35%) had documented descriptions of drainage. A chi-square analysis was performed to determine group differences. There was a statistically significant difference in the incidence of blisters and drainage between the wrap group and the control group (see table 2).

Table 2
Wound Complications

Wrap Group	**Control Group**	
Blister by Group		
No	452	77
Yes	4	13
Pearson Chi-square = 45.87 (df=1), p< 001		
Drainage by Group		
No	449	55
Yes	7	35
Pearson Chi-square = 147.70 (df=1), p < .001		

A total of 12 patients (3%) in the wrap group experienced thrombotic disease as a result of surgery. Three pulmonary emboli and 10 thrombophlebotic episodes were detected (one patient had both). All were treated successfully.

Prophylactic measures were used on all patients and included anticoagulation with warfarin in adjusted doses according to protime, pneumatic compression devices, support hose, and early mobilization (patients were gotten out of bed within 24 hours of surgery). Literature review shows the incidence of DVT after total hip surgery to range from 3.3% (Colwell et al., 1997) to 26% (Francis et al., 1997).

Unfortunately, when reviewing charts in the retrospective control study, it was found that monitoring for thrombotic disease was either not done or not properly recorded on all patients.

Discussion

Prevention of complications is of paramount importance to decrease the morbidity of medical care. The tremendous personal and financial costs of complications make prevention extremely important.

The role of skin in the prevention of infections has been well established (Lober & Fenske, 1991). Wound complications, such as drainage and blisters, result in additional nursing care and potential infections. The infection rate for clean wounds (operative wounds in which no inflammation is encountered and the respiratory, alimentary, genital, and uninfected urinary tracts are not entered) is 0.7-1.13% (Centers for Disease Control, 1996).

In the control group there was one documented staph aureus infection (1% infection rate) and no infections in the wrap group. In addition, the lower incidence of wound drainage and blister formation in the spica wrap group supports the practice of compressive wound support using a spica wrap.

The average age of patients undergoing hip surgery in this study places these patients in the elderly category, and the aged skin is particularly susceptible to damage from taping. As seen in the current study, hip wound care can be achieved without the use of tape.

The study sample has a very low rate (3%) of thrombotic disease, which suggests that the method of prophylaxis (low-does warfarin, pneumatic compression devices, support hose, and mobilization) is efficacious and that the wrap dressing does not contribute to the formation of deep vein thrombosis or pulmonary embolism.

Many patients who had previous hip surgery commented that the wrap support made them feel more secure. This feeling could contribute to the early mobilization, which is important in preventing thrombotic disease.

There were several limitations of the study. The retrospective nature of data collection, particularly in the control group, does not allow for direct comparison of some of the variables. The comparison of one physician for the wrap group versus several physicians for the control group may be a limiting factor. Last, the control group differed from the wrap group in terms of age, the reason for surgery, and surgical procedure.

From a nursing standpoint, using the spica wrap instead of a traditional taped dressing is advantageous, and several nursing diagnoses may apply (see table 3).

To apply a commercial spica wrap requires a new set of skills as compared to taping, but once learned, the wrap is easy to apply and easy to unfasten to check wounds. The time involved in taking care of tape blisters by the nursing staff could be eliminated with spica wrap supports.

The prevention of complications from tape is well worth the effort. The patients with pain from tape blisters are more difficult to mobilize, and all of the inherent side effects of immobilization need to be considered.

Conclusions and Recommendations

The hip spica wrap provided compression and held a surgical dressing in place without placing tape on the patient's skin. The blister and drainage rates were lower for the hip wrap group when compared to an available control group.

The complication rates for the hip wrap group were low and were less than other studies with regard to infection and thrombotic disease. The results suggest that the tape not be used for hip surgery wounds. The compressive support of a spica wrap is recommended to hold the surgical dressing in place without the use of tape. Future research could include a replication of the study using a prospective, randomized, experimental design to validate the benefits of a hip compression dressing.

Table 3
Nursing Diagnoses for Patients with Spica Wrap after Hip Surgery

Nursing Diagnosis	Expect Outcome(s)	Interventions
Alteration in comfort due to pain	• Patient verbalized relief or reduction in pain	• Reposition and support affected hip (per physician protocol) to promote general comfort • Elevate affected extremity to decrease vasocongestion • Adjust spica wrap for comfort and compression • Respond on timely basis to request for analgesia • Medicate 30 minutes before wound care/physical therapy to decrease pain from movement • Teach relaxation techniques
Alteration in Peripheral Tissue Perfusion	• Patient has adequate blood flow to extremity as evidenced by warm skin and absence of edema and pain • Patient does not experience pulmonary embolism as evidenced by normal breathing, normal heart rate, and absence of chest pain	• Assess for signs and symptoms of superficial vs. DVT • Assess for contributing factors, i.e., immobility, varicose veins, obesity, constriction from compression hose and/or spica wrap • Maintain adequate hydration • Encourage elevation of legs • Encourage ambulation per physician order • Encourage ankle pumps • Apply and maintain SCDs and elastic stockings as prescribed • Monitor coagulation profile (PT/PTT) • Administer and monitor anticoagulation therapy as ordered • Monitor results of blood flow studies (ultrasound, venogram)
High Risk for Neurovascular Dysfunction	• Patient maintains adequate neurovascular function as evidenced by warm extremities, good color, good capillary refill, absence of pain/numbness, bilaterally equal pulses	• Assess and compare neurovascular status of both lower extremities preoperatively and postoperatively • Assess lower extremities for signs and symptoms of neurovascular dysfunction/damage (pain, coolness, pallor, cyanosis, decreased pulses, paresthesia, edema, sluggish/absent capillary refill, foot drop) • Check SCDs, elastic stockings, spica wrap for extreme tightness • Notify physician if signs of altered NVS are noted
Impaired Physical Mobility	• Patient maintains maximum mobility within prescribed restrictions	• Encourage isometrics, active and resistive range of motion exercises to all unaffected joints QID as tolerated to prevent atrophy and maintain muscle strength • Assist up to chair when ordered; teach transfer technique • Reinforce walker/crutch ambulation, as taught by physical therapy, using appropriate weight bearing on affected side
Impaired Skin Integrity	• Patient maintains intact skin	• Assess incision for redness/breakdown/drainage • Assess bony prominences for redness/breakdown • Maintain adequate hydration and nutrition • Reposition on regular basis per physician protocol • Assess spica wrap for soil and or dampness
Potential for Infection	• Patient is free of infection as evidenced by temp. W.N.L.; absence of drainage/odor around surgical site	• Assess incision for local signs of infection • Assess for systemic infection signs • Monitor vital signs • Maintain adequate hydration and nutrition to promote wound healing • Keep dressing and spica wrap dry and intact; give wound care as ordered • Administer antibiotics as prescribed

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Author:

Gloria J. Hahn, RN is an Orthopaedic Clinician for a total joint orthopaedist in private practice in Redding, Califonria.

Dee Grant, BSN, RNFA, was an OR First Assistant at St. Joseph's Medical Center in Albuquerque, New Mexico, at the time the research was done.

Cheryl Bartke, BSN, RN, is in the Orthopaedic Department at Mercy Medical Center in Redding, California.

JoLynn McCartin, BSN, RN, is in the Orthopaedic Department at Mercy Medical Center in Redding, California.

Ronald M. Carn, MD, is an Orthopaedic Surgeon/Total Joint Specialist in private practice and Director of The Joint Care Center, Redding Medical Center in Redding, California.