

Efficacy of Diluted Betadine Solution Irrigation in the Prevention of Postoperative Infection of Spinal Surgery

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الخلاصة

التهابات الجروح الجرثومية بعد عمليات جراحة الحبل الشوكي والعمود الفقري هي من مضاعفات الخطيرة التي ترهق المريض طبيا واقتصاديا البوفيدين ايودين هو مضاد جرثومي ومعقم واسع النطاق. وفي هذه الدراسة تقييم كفاءة استخدام مادة البوفيدين ايودين المخفف كمضاد جرثومي لتقليل الالتهابات بعد عملية جراحة الحبل الشوكي والعمود الفقري. تم تخذ 100 مريض مجراة لهم عمليات فتح فقرات للعمود الفقري وتم تقسيمهم الى مجموعتين كل واحد تضم 50 مريض. في المجموعه الاولى تم غسل جرح العمليه قبل الخياطه بمادة البيتادين المخفف (3و5) ولم تتم هذه العمليه في المجموعه الثانيه. وكانت النتائج كما يلي: بعد متابعة المرضى لمدة 4 اشهر في كلتا المجموعتين لم يحصل التهاب جرثومي في المجموعه الاولى. وفي المجموعه الثانيه مريض واحد تم تعرضه لالتهاب جرثومي سطحي (2%) وثلاثة مرضى تعرضوا لالتهابات الجروح العميقة (3%). ومن هنا نستنتج اهمية استخدام مادة البتادين والتي هي زهيدة الثمن (التي تستعمل في العمليات الجراحية للتعقيم قبل العملية) داخل الانسجة الرخوة اثناء الجراحة في عمليات العمود الفقري للتقليل من الالتهابات الجرثومية التي قد تكون عبئا على المريض وعلى المستشفى اقتصاديا و اجتماعيا .

Abstract

Background: Deep wound infection is a serious complication of spinal surgery that can jeopardize patient outcomes and increase costs. Povidone iodine is a widely used antiseptic with bactericidal activity against a wide spectrum of pathogens, including methicillin-resistant *Staphylococcus aureus*.

Objectives: To evaluate the efficacy of diluted betadine irrigation of spinal surgical wounds in prevention of postoperative wound infection.

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Patients and Methods: One hundred patients of both sex aged 25-65 years old were enrolled in this prospective study. The patients were randomized in to two equal groups. In group 1 (50 patients), surgical wounds were irrigated with diluted betadine solution (3.5% betadine) before wound closure. In group 2(50 patients), the wounds were not irrigated and serve as a control. Otherwise, perioperative management was the same for both groups.

Results: Mean length of follow-up was 24 months in both groups (range, 12–24 months). No wound infection occurred in group 1. One superficial infection (2%) and six deep infections (12%) occurred in group 2.

Conclusions: Diluted Betadine effectively prevents spinal surgery wound infection therefore it is recommended to use this simple and inexpensive antiseptic substance following spinal surgery.

Key Words:

1. Spine surgery.
2. Betadine.
3. Postoperative infection³

Introduction

Deep infection after spinal surgery is a debilitating complication, increasing the risk for pseudarthrosis, poor outcome, adverse neurological sequelae, and death. The medical, economic, and social costs of such infections are enormous^[1,2]. Despite advances in prophylactic antibiotic therapy, surgical techniques, and postoperative care, wound infection continues to compromise patient outcomes following spinal surgery. Prophylactic antibiotics have markedly reduced the rate of deep wound infection^[3]. In a recent meta-analysis, infection rates were 2.2% in patients treated with prophylactic antibiotics versus 5.9% without^[4].

Effort has been directed towards identifying preoperative, intraoperative, and postoperative risk factors that correlate with infection following spinal surgery^[3,4,5,6,7].

Despite these efforts, wound infection still occurs and remains a devastating complication.

Irrigation of surgical wounds with antibiotics and antiseptics has been used for decades to decrease infection rates ^[8]. Numerous in vitro and animal studies have demonstrated the effectiveness of topical antibiotics in eliminating causative organisms encountered during surgery. Rosenstein et al^[8] showed that most clinical studies of topical antibiotics were performed in the field of general surgery. In a review of topical antibiotic prophylaxis in neurosurgery, Haines^[9] concluded that intraoperative topical antibiotics would be beneficial for surgical wounds with high infection risk (>15%), but that no sound scientific evidence supported the use of prophylactic topical antibiotics for wounds with a risk of infection <5%. Povidone iodine is a complex of polyvinyl pyrrolidone and triiodine ions that is widely used as an antiseptic for skin, mucous membranes, and wounds. Povidone iodine has bactericidal activity against a wide spectrum of pathogens, including methicillin-resistant *Staphylococcus aureus* (MRSA). In experimental studies, povidone iodine solution has been found to be maximally effective against MRSA in a dilution of 1:25 to 1:200 (0.5–4% betadine). Cytotoxicity has been observed in cultured chicken tibia osteoblasts at a betadine concentration of 5%. But few cytotoxic effects occur at a lower betadine concentration of 0.5% ^[10]. There is currently insufficient data regarding the effectiveness of topical antibiotics for prevention of postoperative infection ^[6]. Therefore this study was designed to evaluate the prophylactic effect of diluted betadine solution in spinal surgery particularly deep infection.

Patients and Methods

Between January 2007 and Jan 2008, a total of 100 consecutive eligible patients undergoing spinal surgery were enrolled in this study (in Neurosurgical Hospital in Baghdad and in Al Diwaniyah Teaching Hospital).

The patients were randomized in to two equal groups; 1 and 2. In group 1(50 patients), the surgical wound was soaked with diluted povidone iodine solution for 3 minutes after procedures such as decompression, discectomy, or tumor excision. The commercially available betadine solution used had a concentration of 10% povidone iodine (100 mg of povidone iodine/ mL of solution, Pharmaline-Lebanon). Approximately 5 mL of povidone iodine was diluted with normal saline to achieve a 0.35% povidone iodine (3.5% betadine) solution for use during operation. The wound was irrigated with copious amounts of normal saline (500mL) after betadine solution irrigation. In group 2 (50 patients), irrigation with copious normal saline (500 mL) was performed alone, this group serve as a control. Postoperative care was otherwise similar in both groups.

Patients eligible for enrolment are those who diagnosed to have degenerative scoliosis or stenosis, degenerative disc disease, disc prolapse, traumatic spinal fracture, and spinal metastasis lesions. Operative procedures included decompression for degenerative stenosis; discectomy for disc prolapse. Surgical sites included cervical (20 cases) and thoracolumbar spine (10 cases) lumbosacral (70 cases) individualized according pathology. Patients with suspected pyogenic vertebral osteomyelitis, discitis, or any form of preoperative spinal infection were excluded from the study. Patients with fever or other suspected sources of infection were also exclude.

All surgery was performed under aseptic technique but without routine ultraviolet light, laminar flow, or other special air measures. Isolation suits were not used.

Intravenous cefotaxime was given for each patient 1 hour before surgery (500 mg, one dose) and postoperatively 500 mg every 8 hours for 7 days. Bed rest was discontinued after 24 hours using appropriate brace wear.

Follow-up performed at 2 weeks, 4 weeks, and 2 months after surgery, and thereafter at 3-month intervals. Major underlying

diseases such as diabetes mellitus (DM) and significant cardiovascular disease (CVD) were recorded. Individual operation history, operative times, volume of blood loss, volume of blood transfusion, preoperative fasting blood sugar, preoperative white blood cell count, hemoglobin concentration, and level of fixation were recorded. Radiologic evaluation was performed at each review. Infection was suspected when unusual pain, tenderness, erythema, induration, fever, or wound drainage was noted. Such findings were investigated with measurement of erythrocyte sedimentation rate, C-reactive protein, and bacteriological cultures from the operative site or blood.^[11,6,10] Cultures were obtained from blood and wound discharge by aseptic methods. All patients with highly suspected wound infection underwent surgical debridement. In addition copious normal saline irrigation was performed. If anastomosis and sutures of the fascial layer were intact without fistula, and no pus drained from the subfascial layer, infection was defined as superficial. Otherwise, the subfascial layer was opened, and culture and debridement performed. Spinal instruments were removed if gross pus was noted in the subfascial layer.

Results

The average age was 44 years in group 1 and 52 in group 2. No wound infection was observed in group 1 during the follow-up period. One superficial infection and six deep infections (a total of seven wound infections) were noted in group 2 (Figure 1). There was no significant difference in the incidence of superficial infection between the two groups. The deep infection rate and total infection rate between the two groups were significantly different. There was no other statistically significant difference in the recorded data between the two groups.

The average age of patients who experienced infection was 52 years, which was older than those without postoperative infection (44 years) but not significantly different.

Male to female ratio, fasting blood sugar, preoperative hemoglobin concentration, preoperative white blood cell count, operative time, operative blood loss, and volume of blood transfusion were all not significantly different between the two groups. The presence of significant CVD, presence of DM, and previous spinal surgery at the same area were all not significantly different. Infection occurred on average 14 days after the index procedure (range, 5–30 days).

Wound discharge, dehiscence, and erythema at the incision site were the most common presenting features. Of the seven cases with postoperative wound infection, all yielded positive bacteriologic cultures. *Staphylococcus aureus* was isolated in the wound discharge of six cases; five of them MRSA. Combined infection with *Proteus mirabilis* and enterococcus was noted in one case. Thus, 86% of patients had postoperative infection attributable to a single pathogen and 14% to two pathogens (table 1).

Discussion

Deep infection after spinal surgery is a debilitating complication, increasing the risk for pseudarthrosis, poor outcome, adverse neurological sequelae, and death. The medical, economic, and social costs of such infections are enormous.^[1,2] Despite advances in prophylactic antibiotic therapy, surgical techniques, and postoperative care, wound infection continues to compromise patient outcomes following spinal surgery. In this study, we observed that the overall infection rate in group 2 (14%), with one superficial wound infections (2%), was comparable to previous reports.^[3-9] Group 1 patients, who received betadine solution irrigation, had no postoperative infection during the follow-up period. Apart from the use of betadine solution irrigation, no other factors differed between the two groups. Wound drainage and dehiscence were the most common presenting signs of infection in our series. The average time to presentation of infection was 14 days (range, 5–30 days).

The most commonly identified organism was *Staphylococcus aureus* (mostly MRSA) which was comparable with previous

studies.^[6, 10,11] Though no wound infection developed in group 1, this does not suggest that diluted betadine solution irrigation alone will prevent wound infection. Intraoperative aseptic measures, diligent surgical procedures, postoperative wound drainage, and systemic antibiotics were used in all of our cases. Despite attention to aseptic surgical technique, bacterial seeding from air and clothing may occur in even the most modern operating rooms. Ahl, Lohnstein and Bergman considered air borne bacteria in the operating room the main source of wound infection and suggested the use of laminar flow.^[13] However, routine ultraviolet lights, laminar flow, or isolation suits may not be available in many institutions or in developing countries. Wound irrigation with diluted betadine before wound closure, as we describe, may be a simple and practical method of infection prevention. The main effect of betadine solution is to eradicate bacterial seeding from the surgical wound and to achieve intraoperative disinfection. Topical irrigation with diluted betadine solution in our study was safe, fast, simple, and inexpensive, and reduced the incidence of infection after spinal surgery. We recommend this easy and inexpensive antiseptic tool, particularly in patients who have accidental intraoperative wound contamination and risk factors for wound infection, prophylaxis against postoperative spinal wound infection for. In addition further studies are warranted to clarify the efficacy of topical betadine irrigation in these circumstances and to confirm our results.

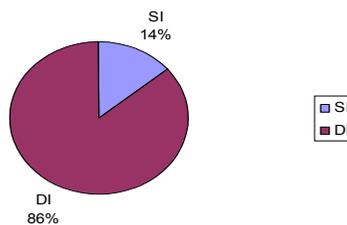


Figure (1): Pie chart shows the percentage (a total 7 cases) of spinal superficial infection (SI) and deep infection (DI)

Table (1): shows the total no. of cases with postoperative wound infection with bacteriological culture with type and percentage of pathogen.

No. of Pathogen	Type of Pathogen	Total No.(7)	Percentage
Single pathogen	Staph aureus	6	86%
Two pathogen	Proteus mirabilis, Enterococcus	1	14%

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