INFLUENCE OF INTRAOPERATIVE IODINE SOLUTION LAVAGE FOLLOWED BY “WOUND SCRUBBING” TECHNIQUE ON SSI FREQUENCY

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The aim of the study was to assess whether intraoperative use of the “wound scrubbing” technique (iodine solution lavage followed by intensive scrubbing of the wound with a surgical drape) reduces the number of surgical site infection (SSI) incidents, considering patients after colorectal surgery.

Material and methods. The study group comprised 98 patients qualified towards colorectal surgery during the period between November, 2007 and November, 2008. Patients were divided into two groups: Fifty patients were subject to the “wound scrubbing” technique (group I), while 48 patients constituted the control group (group II) where the wound was treated traditionally-subcutaneous tissue hemostasis was assured, least traumatically. In case of both groups subcutaneous tissue swabs were collected before wound suturing. Primary cutaneous sutures were applied in all patients. The diagnosis of a surgical site infection was based on the criteria established by the National Nosocomial Infections Surveillance (NNIS) group.

Results. According to the NNIS criteria, superficial SSI was diagnosed in 12 patients (12.3%): 4 from the “wound scrubbing” group (8%) and 8 from the control group (16.7%). Deep tissue infections were not observed. Gram-negative bacteria were most often isolated, both in case of group II patients, and SSI cases. Considering the “wound scrubbing” group 66% of intraoperative swabs proved to be sterile.

Conclusions. 1. The “wound scrubbing” technique reduces the risk of SSI in case of patients subject to colorectal surgery. 2. Microbial contamination of the postoperative wound (groups II-IV, according to the NNIS) before the introduction of cutaneous sutures directly influences the frequency of surgical site infections.

Key words: surgical site infection, “wound scrubbing” technique, povidone iodine, antiseptic

Surgical site infections (SSI) are the most common surgical complication diagnosed in nearly 3% of all surgical procedures. Considering patients subject to colorectal surgery the general risk of surgical site infections increases, too more than 10%. One of the most common documented risk factors of surgical site infections is the degree of contamination of the operative field. In case of superficial SSI the contamination of the operative wound before the application of cutaneous sutures seems most important. In case of clean-contaminated wounds (II category, according to the National Nosocomial Infections Surveillance group) the incidence of SSI is estimated at 4-11%. In case of contaminated wounds (III NNIS category) the incidence of SSI ranges between 10-17%, while in case of “dirty” wounds (category IV) even 30% of procedures are burdened with the risk of septic complications (1, 2). Considering the many perioperative activities leading towards the reduction of the risk of SSI, the rarely applied and poorly documented procedures include intraoperative “cleaning” of the contaminated wound.

The aim of the study was to assess whether the intraoperative use of the wound scrubbing technique (iodine solution lavage fol-
Influence of intraoperative iodine solution lavage followed by “wound scrubbing” technique on SSI frequency

followed by intensive scrubbing of the wound with a surgical drape) reduces the number of SSI incidents, considering patients after colorectal surgery.

MATERIAL AND METHODS

The study group comprised patients treated at the Department of General, Gastroenterological and Nutritional Surgery, Pomeranian Traumatology Center in Gdańsk, qualified towards elective and emergency laparotomy procedures. Patients were randomly divided into two groups:

Group I – patients subject to the „wound scrubbing” technique, which consisted in iodine solution lavage after applying fascial sutures (Betadine diluted in 0.9%NaCl - 1:1), followed by intensive scrubbing of the wound by means of a surgical drape until subcutaneous tissue capillary bleeding. Hemostasis was obtained following bipolar coagulation.

Group II – control group: the surgical wound was subject to traditional treatment, assuring subcutaneous tissue hemostasis, least traumatically.

In case of both patient groups subcutaneous tissue swabs were collected before the application of primary cutaneous sutures, which were applied in all subjects. All patients undergoing elective surgery were subject to standard antibiotic prophylaxis: cefuroxime –1.5 g and metronidazol – 1 g in three doses, perioperatively. In case of emergency surgery with coexisting peritonitis patients additionally received amoxicillin with clavulonic acid (1.2 g) and metronidazol (0.5 g), every eight hours. Standard patient preparation towards elective surgery consisted in the administration of osmotic preparations aimed at cleansing the bowels (Fortrans). The skin was trimmed on the day of the operation at the site of the planned operative field. Both in case of elective and emergency procedures the edges of the wound were lined with towels soaked in Betadine.

After the intraoperative evaluation of the degree of contamination of the operative field patients from both groups were classified to the appropriate wound contamination NNIS category: clean-contaminated field (II category), contaminated field (III category), “dirty” field (IV category).

Study exclusion factors were as follows: preoperative antibiotic therapy exceeding 24 hours, and postoperative therapy other than for SSI complications, impaired immunity in patients on chronic steroid or other immunosuppressive therapy, infectious diseases of the skin in the vicinity of the planned operative field.

Diagnosis of a surgical site infection was based on National Nosocomial Infections Surveillance (NNIS) criteria (3). The wound was evaluated 3, 5 and 7 days postoperatively. After discharge from the hospital patients remained under ambulatory care, where they reported in case of operative wound symptom occurrence. In case of symptoms of infection the purulent content or wound swab was collected and cultures were performed.

The STATISTICA 8.0 program was used for statistical analysis. Statistical significance was determined on the basis of chi-square test results.

RESULTS

During the period between November, 2007 and November, 2008, 98 patients were included in the study. Group I comprised 50 patients subject to “wound scrubbing”, while 48 patients constituted the control group (group II). Both groups were similar considering surgical procedure characteristics, especially in terms of the category of contamination of the operative field, according to the NNIS classification. In 72 patients the operative field was evaluated as clean-contaminated (group I – 38, group II – 34), in 14 as contaminated (group I – 6, group II – 8), and in 12 as “dirty” (group I – 6, group II – 6). In case of group I, 36 patients were subject to elective surgery, while 14 underwent emergency surgery. In case of group II, there were 34 and 14 patients, respectively. Mean patient age considering both groups was 62.3 and 66.4 years, respectively.

Twelve patients were diagnosed with superficial SSI (12.3% of the population). Considering group I patients wound contamination was observed in four (8%) cases. In case of group II the above-mentioned was observed in 8 (16.7%) patients. The observed differences were statistically insignificant, that is the relationship between “wound scrubbing” and infection occurrence (contingency coefficient-0.131; chi-square test result – 1.71; statistical significance: p=0.19).

Deep tissue SSI was not observed. The surgical site infection rate was higher, the great-
er the degree of contamination. Considering group I patients the incidence of SSI in all NNIS categories was lower, as compared to the control group: category II – 5.6% (2.6% vs 8.8%), category III – 21.4% (16.7% vs 25%), and category IV – 41.7% (33.4% vs 50%) (tab. 1). Based on chi-square test results with Yates correction the observed differences were statistically insignificant.

Table 1. Surgical site infection rate considering the category of contamination of the operative field, according to the NNIS classification

<table>
<thead>
<tr>
<th>Category of Contamination</th>
<th>Group I (n=50)</th>
<th>Group II (n=48)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical site infection</td>
<td>4/50 (8%)</td>
<td>8/48 (16.7%)</td>
</tr>
<tr>
<td>Clean – contaminated (II cat.)</td>
<td>1/38 (2.6%)</td>
<td>3/34 (8.8%)</td>
</tr>
<tr>
<td>Contaminated field (III cat.)</td>
<td>1/6 (16.7%)</td>
<td>2/8 (25%)</td>
</tr>
<tr>
<td>Dirty field (IV cat.)</td>
<td>2/6 (33.4%)</td>
<td>3/6 (50%)</td>
</tr>
</tbody>
</table>

Intraoperative swab results in the “wound scrubbing” group were negative in 60% of cases, while in case of positive cultures E.coli, Enterobacteriacae, Enterococcus, Bacteroides bacteria predominated. Similar bacterial flora was observed in the control group. However, statistically significant laparotomy wound contamination amounted to 67% (p=0.008-statistical significance, the chi-square test result – 6.992). In only 33% of patients culture results were aseptic (fig. 1).

In case of SSI diagnosis the pathogens were similar to those collected from intraoperative cultures. Gram-negative bacilli dominated, and in more than 50% of SSI cases patients were diagnosed with more than one pathogen (fig. 2). In 58% of cases (7 of 12 patients) the bacterial flora responsible for SSI corresponded to that of intraoperative cultures.

Considering patients with SSI the hospitalization period was prolonged by an average of 2 days, as compared to the control group (9.8 vs 7.6 days).

**DISCUSSION**

Although literature data described different forms of mechanical wound contamination prevention, publications concerning the „wound scrubbing” technique are rare. The wound scrubbing technique was applied in case of dirty posttraumatic wounds with the intention of removing the foreign bodies (4, 5, 6). Two reports from one center demonstrated significant reduction of the bacterial count in case of contaminated animal model wounds subject to scrubbing and lavage (irrigation) (7, 8). There are many publications considering techniques aimed at reducing the contamination of the wound by means of operative field

![Fig. 1. The epidemiology of the operative wound, considering group I (with scrubbing) and group II (control) patients](image-url)
Influence of intraoperative iodine solution lavage followed by “wound scrubbing” technique on ssi frequency

In order to avoid the occurrence of septic complications it is important to prevent the development of wound hematomas. Intensive scrubbing of the wound leads towards subcutaneous tissue bleeding, thus, the importance of proper hemostasis after the above-mentioned procedure. The higher degree of wound contamination, as presented by the above-mentioned results has a clear bearing on the risk of developing surgical site infections (SSIs). The high rate of wound infections considering the control group is worth mentioning, significantly exceeding data presented in medical literature (1, 2). This might be connected with the stringent criteria of the NNIS classification applied in case of surgical site infection diagnosis, as well as the underestimation of the actual number of infectious complications in patients after colorectal surgery (12). The small number of patients qualified towards the contaminated and dirty wound categories is evidence of the statistical insignificance, considering group differences.

The bacterial flora cultured from the operative wounds is similar in both groups, being characteristic of colorectal surgery procedures, including intestinal bacteria (gram negative bacilli) migrating towards the subcutaneous tissues. The typical pathogens of hospital infections connected with the improper care of the operative wound are responsible for the small number of surgical site infections.

The wound scrubbing technique seems to be a valuable method in the struggle with the frequent septic complications observed after colorectal procedures. Its main advantages include simplicity of implementation, low price, and non time-consuming. Thus, one can observe a lower incidence of SSIs and shorter patient hospitalization. The usefulness of this method requires further investigations performed on a larger group of patients with significant contamination of the operative field.

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