ELSEVIER

Ambulatory Surgery 9 (2001) 109–112

Ambulatory Surgery

www.elsevier.com/locate/ambsur

Wound infection in day-surgery

Bjarne Grøgaard [a,*], Elizabeth Kimsås [b], Johan Ræder [c]

[a] *Orthopedic Department, Ullevaal University Hospital, 0407 Oslo, Norway*
[b] *Department for Plastic and Reconstructive Surgery, Rigshospitalet, Oslo, Norway*
[c] *Department of Anesthesiology, Ullevaal University Hospital, Oslo, Norway*

Received 1 March 2001; accepted 2 May 2001

Abstract

To determine the surgical wound infection rate associated with day-surgery and to assess whether infection was related to patient factors, a prospective study of all electively operated adult day-cases was carried out during a 6 month period between January and June 1996. The study included gastroenterological orthopaedic, vascular, plastic and urological surgery. No operations involving obviously infected patients were performed in the unit. Strict criteria for diagnosis of infection were used. All patients were examined on the 7th and 30th post-operative day. A total of 642 (98.8%) patients were included (316 females 334 males). Infection developed in 22 of the 642 patients (3.5%), only three were diagnosed before the 7th day visit. Orthopaedic procedures accounted for more than 40% of the surgery, but only 22.7% of the wound infections. Gastroenterology made up nearly 36% of the procedures and accounted for 36.4% of the infections. Vascular procedures were 5.7% of the total but accounted for 18% of the infections. No correlation was found between age, gender, operation time or ASA-group and the infection rate. The study is to small to quantify with statistical significance risk-factors associated with wound infection in ambulatory surgery. Our data may suggest that the type of surgery as well as individual factors associated with surgeons may influence the wound infection rate.

Keywords: Wound infection; Day-surgery; Patient

1. Introduction

Absence of post-operative wound infection is an important part of the successful outcome of an operative procedure. Surgical wound infection rates have been determined for a number of surgical procedures, but most of these figures have been compiled from data on hospital inpatients. Whereas wound infection rates in inpatients are evaluated routinely during quality-assurance reviews, this has not been the case in most day-surgery clinics as close patient follow-up is difficult to achieve after discharge.

The amount of ambulatory surgery being performed is increasing. The number of cases scheduled, as well as the list of procedures offered, has grown.

The primary objective of this study was to determine the surgical wound infection rate associated with elective operations in the adult day-surgery unit of a large, university-based, teaching hospital. A secondary objective was to assess whether the infections were related to patient factors, such as ASA-group [1], obesity or type of the surgical incision or external factors such as duration of surgery, surgeon in charge or time during the day that the operation took place.

2. Materials and methods

The day surgery unit at Ullevaal hospital is physically separated from the rest of the hospital. It includes two operating theatres, six post-operative beds and a step-down area. The unit is located in an old building with virtually no controlled ventilation.

Particle concentration in the air (number per m^3) were measured at two different occasions immediately prior to the study. A considerable increase in the number of particles during the day (from < 100 to > 300 particles per m^3) were demonstrated (personal communication).

* Corresponding author.
E-mail address: bjarne.groegaard@ulleval.no (B. Grøgaard).

0966-6532/01/$ - see front matter
PII: S0966-6532(01)00106-8

2.1. Patients

A prospective study of all adult patients undergoing elective day-case surgery was carried out during a 6 month period between January and June 1996.

Patients using antibiotics, pre- or post-operatively, whether as prophylaxis or treatment, were excluded.

No operations involving obviously infected wounds were performed in the unit. Patients suffering from hepatitis or human immunodeficiency virus (HIV) and patients with anorectal surgery were excluded.

Skin preparation consisted of electric shaving immediately prior to surgery. Red chlorhexidine gluconate solution (5 mg/ml) was used as a pre-operative antiseptic skin preparation. Cloth drapes were standard and steridrapes were not used.

2.2. Definition of infection

All incisions were examined on the 7th and 30th post-operative day by one of two observers. The diagnosis of infection was based on fulfilment of one from the following criteria,

1. discharge of pus from the wound;
2. microrganisms present in swabs taken from any discharge from the wound;
3. surgical revision and drainage of the wound with positive bacteriology;
4. antibiotic treatment due to clinically suspect infection.

Deep infection was defined as infection located under the deep fascia or intra-articularly.

If in doubt, whether there was an infection or not, the patient was invited to follow-up visits until the wound was healed or classified as infected.

2.3. Collection of data

Factors associated with the procedures were documented for each patient at the time of the operation. Such factors included the name of the surgeon; name of the scrub- and assisting nurse; type and duration of the procedure; location of the incision; ASA-class of anaesthesia risk [1] and whether the procedure involved the use of implants.

2.4. Analysis of the data

A rate of infection was calculated for the entire population as well as for each speciality and each possible risk factor. The data were analysed with Student's t-test and $P < 0.05$ was considered statistically significant.

3. Results

Of the 692 patients operated on in the unit during the study period 42 had anal or perianal procedures and were therefore excluded. Six hundred and fifty patients (316 women, 334 men) were thus recruited for the study. All patients attended the 7th day visit. A total of 35 patients failed to attend the 30th day visit. They were contacted either by telephone or by a letter. Eight patients could not be traced which left 642 (98.8%; 316 female, 334 male) patients for complete evaluation.

The average age of the 334 male patients was 49 years (range 4–81 years), and the average age of the 316 female patients was 46 years (range 6–85 years). Occasionally children are operated on in the adult unit. In our study 15 patients were less than 16 years of age (Fig. 1).

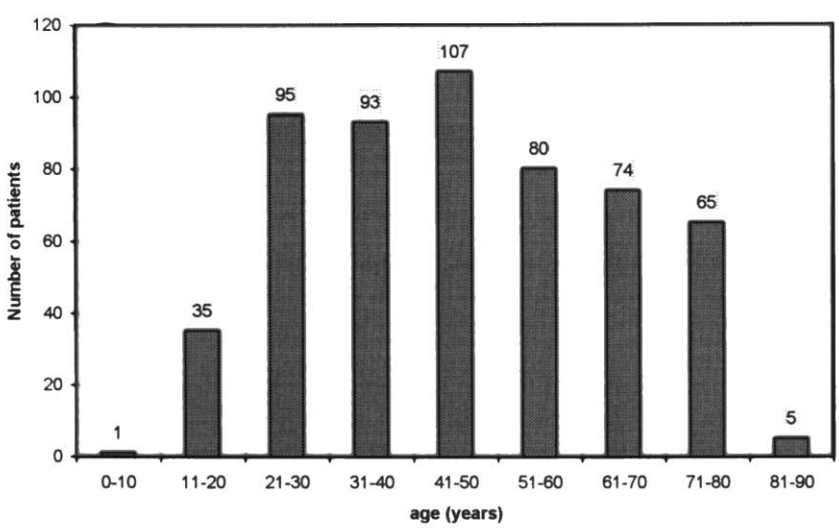

Fig. 1. Age distribution of 642 patients operated on in a day surgery unit.

Table 1
Demographic data for the total number of patients operated compared with patients suffering post-operative wound infection

	Total	Infected	%	
Age (years)	46.6 (18.7)	50.5 (19.1)		ns
Gender (men)	334	12	3.6	
(women)	316	10	3.2	
Operation time (min)	58.0 (46.1)	48.2 (40.3)		ns
ASA				
1	517	14	2.7	
2	105	6	5.6	
3	20	1	5.0	
4	0	0		
Body mass index (BMI)	25.1 (3.1)	23.7 (4.8)		ns

Numbers within parenthesis are S.D.

The study included surgeons from five different specialities (gastroenterological, orthopaedic, vascular, plastic and urological surgery). The number of procedures within each speciality are depicted in Table 1. All procedures were elective.

3.1. Over-all rate of wound infection

Superficial infection of the operation wound developed in 22 of 642 patients (ten female, 12 male), a rate of 3.5% (Tables 1 and 2). There was no significant difference in age between the infected and non-infected patients. No relationship was observed between increasing ASA-group and the rate of infection. No deep infection was encountered.

There was no correlation between the duration of surgery and the infection rate. Neither was there any relationship between infection rate and different scrub nurses.

Four infections (early infections) were evident before the control at the 7th post-operative day. The remaining 18 infections (late infections) were diagnosed at a mean of 12.1 days post-operatively (range 8–20 days).

Twelve of the infected patients were treated by their local physician before the 7th day visit. Nine were treated with antibiotics due to clinically suspect wounds without swabs being taken (criteria 4). Three were treated after swabs were taken (criteria 2). Ten patients were treated by hospital doctors, four had to be readmitted and three were surgically revised (criteria 3). Orthopaedic procedures accounted for more than 40% of the surgery, but only 22.7% of the wound infections. Gastroenterology made up nearly 36% of the procedures and accounted for 36.4% of the infections. Vascular procedures were 5.7% of the total but accounted for 18% of the infections.

Table 2
Numbers of procedures and post-operative infections for each speciality

Speciality	Number of procedures	Number of infections
Orthopaedic	264 (41.1)	5 (1.9)
Gastroenterology	230 (35.8)	8 (3.5)
Plastic	107 (16.6)	5 (4.7)
Vascular	37 (5.7)	4 (10.8)
Urology	12 (1.8)	0
Total	642	22 (3.4)

Numbers within parenthesis are percent of total.

Four patients were hospitalised for treatment of the infection while 18 received antibiotic treatment as outpatients.

A total of 64 (47 female, 17 male) laparoscopic cholecystectomies were performed of which three (4.7%) suffered an infection (two female, one male). All three were infected in the umbilical incision.

Of the 166 other gastroenterology procedures, five patients suffered a wound infection (3.0%). All five had an inguinal hernia operation (five infections out of 95 inguinal hernial operations, 5.3%). One patient had a prolonged procedure with laparoscopic technique which, during the procedure, was converted to open technique. All of the infected patients were males. One surgeon had three infections out of nine cases, the other two infections occurred after two different surgeons performing more than 20 procedures each.

4. Discussion

It has been claimed that ambulatory surgery results in less wound infections compared with inpatient treatment [2–5]. This could be due to less formal follow-up on ambulatory surgery patients and thereby often fragmentary information on complications such as wound infections. However, ambulatory surgery patients are less exposed to hospital bacterial strains, both because of the short stay and the frequent localisation of this kind of surgery in separate, dedicated units. On the other hand ambulatory patients are less exposed to post-operative professional care and this may result in a higher rate of infection as well as less chance of early diagnosis and proper treatment.

The frequency of incisional wound infections in hospitalised patients reported in different studies varies between 5 and 17% [6]. This wide range is explained primarily by different wound and patient categories [7]. For clean surgical wound incisions, the overall infection rate has been reported as less than 2% [8]. According to the Center for Disease Control (CDC) guidelines for prevention of surgical wound infection, the clean wound infection rate is between 1 and 5% [9].

In our study, the overall infection rate was 3.5%. This is within the limits recommended by CDC. The infection rate may seem high compared with other

studies of ambulatory surgery. However, this may be due to confounding factors. We had almost 100% follow-up of our patients for 30 post-operative days, using strict objective criteria for infection. This minimised the risk of underestimation of the infection rate, which seems to be a problem with most previous studies.

In one study, the authors failed to document the criteria for wound infection [10] and reported an extremely low overall infection rate (0.63%). In another study, a wound infection rate of 0.02% from a surgical cohort of 13,433 was reported [11]. In this study, neither the criteria for wound infection nor the type of procedures were defined. Most of the studies were carried out by passive reporting through a questionnaire returned by the patient or attending surgeon [10,11].

Zoutman et al. [5] followed a cohort of 635 patients undergoing day surgery procedures. The patients were telephoned 1 month after their procedure and were questioned about occurrence of a wound infection. They discovered an infection rate of 5.1%.

The definition of a wound infection has proved difficult [12]. The wound infection rate in any study depends as much on the definition of infection and the adequacy of the follow-up as on the surgical practice assessed by the study [13].

To diagnose a surgical wound infection we used the criteria defined by CDC. A more narrow definition would be only those cases, which either needed treatment or had any prolonged recovery or change in outcome. With this definition 17 cases (2.6%) had a clinical significant wound infection in our study.

Our study is to small to quantify with statistical significance risk-factors associated with wound infection in ambulatory surgery. However, our data may suggest that the type of surgery may influence the wound infection rate as well as individual factors associated with surgeons and nurses. These suggestions should be explored in larger scale studies.

References

[1] Tinker JH, Roberts SL. Anesthesia risk. In: Miller RD, editor. Anesthesia, second ed. New York: Churchill Livingstone, 1986:365–6.
[2] Audry G, Johanet S, Achrafi H, Lupold M, Gruner M. The risk of wound infection after inguinal incision in pediatric outpatient surgery. Eur J Pediatr Surg 1994;4:87–9.
[3] Othersen HE Jr, Clatworthy HW Jr. Outpatient herniorrhaphy for infants. Am J Dis Child 1968;116:78–80.
[4] Steward DJ. Outpatient pediatric anesthesia. Anesthesiology 1975;43:268–76.
[5] Zoutman D, Pearce P, Mckenzie M, Taylor G. Surgical wound infections occurring in day surgery patients. Am J Infect Control 1990;18:227–82.
[6] Altmeier WA. Surgical infections: incisional wounds. In: Bennett JV, Brachman PS editors. Hospital Infections. Boston; 1979. p. 287–306.
[7] Craig CP. Infection surveillance for ambulatory surgery patients: an overview. Qual Rev Bull 1983;9:107–11.
[8] Cruse PJE, Foord RA. A 10-years prospective study of 62 939 wounds. Surg Clin North Am 1980;60:27–40.
[9] Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM. CDC definition for nosocomial infections. Am J Infect Control 1988;16:128–40.
[10] Manian FA, Meyer L. Comprehensive surveillance of surgical wound infection in outpatient and inpatient surgery. Infect Control Hosp Epidemiol 1990;11:515–20.
[11] Natof HE. Complications associated with ambulatory surgery. J Am Med Assoc 1980;244:1116–8.
[12] Byrne DJ, Malek M, Davey P, Cuscheri A. Postoperative wound scoring. Biomed Pharmacother 1989;43:669–73.
[13] Holm J. Wound and graft infection. Clinical aspects and prophylaxis. Acta Chir Scand 1985;529(Suppl.):87–9.