One scalpel for major surgical procedures

A bacteriologic study

Avram M. Cooperman, M.D.
Louis D'Amico, M.D.
Tim Sifers, M.D.

Department of General Surgery

Thomas L. Gavan, M.D.

Department of Microbiology

Recently, the question of whether the scalpel blade used to make the skin incision must be discarded because of the fear of contaminating deeper tissues with skin bacteria has been reexamined. Traditionally, once the epidermal and dermal skin layers are incised, the knife blade should be changed so that skin organisms will not be implanted into the subcutaneous tissue, proliferate, and lead to the development of wound infections.

The validity of this belief was tested by doing a bacterial and clinical study of patients undergoing operations when only one knife was used.

Materials and methods

Fifty consecutive patients who underwent operations on one general surgical service (A.M.C.) between March 15, 1974 and May 1, 1974, were included in the study. For all patients the operative site was shaved the evening prior to surgery, and a 5-minute skin preparation with an iodophor (Betadine) was used after induction of anesthesia. Two sterile knife blades were then removed from their packages, and one was cultured by placing it in liquid thioglycolate medium (control). The second blade was used for the incision and discarded only when all layers of skin and subcutaneous tissue were entered or the blade became dull. It was then cultured in liquid thioglycolate medium.

Downloaded from www.ccjm.org on April 24, 2024. For personal use only. All other uses require permission.

Table.

Procedure	No.	Control blade	Case blade	Wound culture	Comment
Cholecystectomy and operative cholangiogram	9	0	0	Staphylococcus coagulase negative, 2 patients	No infection
Herniorrhaphy Inguinal 9 Ventral 1	10	0	0	Staphylococcus coagulase negative, 1 patient	No infection
Staging procedure for Hodgkin's disease (splenectomy, para-aortic lymph node biopsy, liver biopsy)	5	0	0	0	One wound infection
Modified radical mastectomy	2	0	1 staphylococcus coagulase negative	0	No infection
Rt hemicolectomy with ileotransverse colostomy	5	0	1 *Escherichia coli*; alpha streptococcus	1 *Escherichia coli*, staphylococcus coagulase negative	No infection
Takedown cholecystojejunostomy, cholecystectomy	1	0	0	0	...
Laparotomy, cholecystocholangiogram, liver biopsy (cancer pancreas)	1	0	0	0	...
Thyroidectomy, biopsy lt parathyroid	1	0	0	0	...
Common bile duct exploration, duodenotomy, cholecystectomy	1	0	0	0	Mild postoperative wound infection
Rt modified radical neck dissection, rt thyroid lobectomy	1	0	0	0	...
Laparotomy, mesenteric node biopsy, operative pancreatogram	1	0	0	0	...
Laparotomy, gastrotomy, gastric biopsy	1	0	0	0	Mild postoperative wound infection
Laparotomy, Womack-Peters gastric devascularization	1	0	0	0	...
Laparotomy, liver biopsy (cancer pancreas)	1	0	0	0	...
Proximal gastric resection, esophagogastrectomy	1	0	0	0	...
Sigmoid resection with colorectal anastomosis, transcolostomy	1	0	0	0	...
Tracheostomy	1	0	0	0	...
Exploratory laparotomy, open liver biopsy (cirrhosis)	1	0	0	0	...
Gastric resection Billroth II gastrojejunostomy	1	0	0	0	...
Appendectomy and exploratory laparotomy for Meckel's diverticulum	1	0	0	*Escherichia coli*	...
Cholecystectomy with common bile duct exploration	1	0	0	Alpha streptococcus	...
Truncal vagotomy and pyloroplasty	1	0	0	Alpha streptococcus	...
Exploratory laparotomy, biopsy of mass, liver biopsy	1	0	0	0	...
Exploratory laparotomy, parietal cell vagotomy gastrojejunostomy	1	0	0	0	...

Downloaded from www.ccjm.org on April 24, 2024. For personal use only. All other uses require permission.

At the completion of the operation a culture of the wound was taken and the wound was closed. Nylon skin sutures, not subcutaneous sutures, were used. The wound was then examined daily.

Results

A summary of operative procedures, control and scalpel cultures, wound cultures, and clinical wound infection is given in the *Table*.

All of the control blades were sterile, whereas 2 of the 51 blades used for the incisions had positive cultures. None were associated with subsequent wound infection. Ten wound cultures were positive. *Staphylococcus epidermidis* was cultured from five blades, alpha streptococci in four, and *Escherichia coli* and alpha streptococci were cultured from one. In none of these cases did a wound infection develop. Two minor suppurative wound infections developed, one followed a gastrotomy and gastric biopsy, and the other infection followed a common bile duct exploration, duodenostomy, and cholecystectomy. In both cases cultures from the wound and knife were sterile.

Discussion

Several factors determine the frequency of postoperative wound infections: environment, operative technique, and host resistance.[1, 2] In clean or clean contaminated wounds, it is difficult to cite one single factor responsible for the development of a wound infection. Numerous reports have compared methods of skin preparation, the use of prophylactic antibiotics, and the choice of materials used in wound closure; all of which may play a role in the development of wound infections.[3, 4] A detailed discussion of each of these factors is beyond the scope of this paper, but in this study these factors were kept constant by using the same operating rooms, having the same surgical team scrub for each case, and using the same skin preparation, and the same skin closure. In both instances in which knife cultures were positive, wound infections did not develop. In the two cases in which a minor wound infection developed, knife cultures and wound cultures taken at surgery were negative. Although many surgeons have discarded this ritual of using two knives, Jacobs[5] first reported the results of a bacterial study of a group of patients in whom only one knife blade was used for the surgical incision. No clinical infections developed in 37 patients, although one knife culture was positive for *Staphylococcus aureus*.

Cost is a factor that might be considered regarding the practice of using two skin knives. The cost of one knife blade is 18 cents. The maximum annual saving (300 operations per week) would be $2,700.

This study confirms previous work that indicates a low incidence of wound infection (2 of 51 cases) when one knife blade is used for the incision. It is hoped that this will result in abandonment of one surgical ritual at this institution.

References

1. Davidson AI, Smith G: Bacteriological studies in the operating theatre in relation to postoperative wound sepsis. (Abstr) Br J Surg **56:** 705, 1969.

Downloaded from www.ccjm.org on April 24, 2024. For personal use only. All other uses require permission.

2. O'Loughlin JM: Infections in the immunosuppressed patient. Med Clin North Am **59:** 495, 1975.
3. Polk HC Jr, Lopez-Mayor JF: Postoperative wound infection; a prospective study of determinant factors and prevention. Surgery **66:** 97–103, 1969.
4. Grosfeld JL, Solit RW: Prevention of wound infection in perforated appendicitis; experience with delayed primary wound closure. Ann Surg **168:** 891–895, 1968.
5. Jacobs HB: Skin knife—deep knife; the ritual and practice of skin incisions. Ann Surg **179:** 102–104, 1974.

Downloaded from www.ccjm.org on April 24, 2024. For personal use only. All other uses require permission.