# The Reclosure of Postoperative Incisional Abscesses Based on Bacterial Quantification of the Wound

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THE principle of treatment of fresh contaminated wounds by wide debridement and delayed closure is accepted in both military and civilian practice.[3, 8] The treatment of abscesses in postoperative wounds in similar fashion is not universally accepted. There is a reluctance among surgeons to open widely a wound which has been meticulously closed. Howe pointed out that massive wound infections are frequently treated by small openings, inadequate drainage, and catheter irrigations which often results in prolonged convalescence, tissue destruction, and eventual herniation.[6]

Robson and Heggers demonstrated that infections result from contamination by an imbalance in the equilibrium between the bacteria and host resistance.[9] One difference between a septic incision and a contaminated wound is the number of viable bacteria present. Howe stated that once a postoperative wound infection has been converted to a "clean" wound it can be treated as any other wound and surgically closed.[6] We have shown that if 100,000 or fewer bacteria are present per gram of tissue that a wound can be considered "clean" and closed with a 94 per cent chance of success.[11] If following adequate drainage of an incisional abscess the bacterial count could be decreased to $10^5$ organisms or less per gram of tissue, successful reclosure of the wound would be similarly successful.

The purpose of this study is to determine the feasibility of bacterial quantification for determining optimal time for reclosure of incisional abscesses and to compare the hospital courses of patients so treated with the courses of those managed by conventional incision and drainage followed by healing by secondary intention.

## Materials and Methods

All records of postoperative wound infections occurring on the General Surgery Service from December 1966 to March 1969 were reviewed. During the period December 1966 to December 1967 incisional abscesses were treated by removal of sutures and wide drainage of abscesses. The wounds were then debrided daily and packed open until healing by secondary intention occurred. Patients were frequently discharged from the hospital prior to complete healing of the wounds.

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TABLE 1. *Hospitalization Following Drainage of Incisional Abscesses*

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| Wounds handled by secondary intention healing | 22.3 days |
| Wounds handled by bacterial quantification and reclosure | 8 days ($p < 0.01$) |

Beginning January, 1968 quantitative bacteriological evaluation was performed on wounds at the time of incision and drainage using the method described by Robson and Heggers.[9] The open wounds were treated by topical cleansing during the period of delay. Tissue biopsies were obtained daily for quantification. The tissue was weighed and homogenized under sterile conditions, and diluted 1:10 with thioglycollate. 0.02 ml. of the suspension was then delivered to a glass slide confining the inoculin to an area 15 mm. in diameter. The slide was oven-dried for 15 minutes at 75° C. The smear was read under 1.8 mm. (97×) objective after staining it with either a gram stain or the Brown and Brenn modification for tissue staining. The presence of a single organism was considered evidence that the bacterial count was greater than $10^5$ organisms per gram of tissue. Simultaneous aerobic and anaerobic cultures were performed for qualitative identification and antimicrobial sensitivities. When the tissue biopsy of the wound contained $10^5$ bacteria or less per gram of tissue, as evidenced by no organisms on the smear, delayed closure was performed.

The records of all patients with incisional abscesses occurring in incisions of at least 5 cm. in length were reviewed. The length of time required from removal of sutures and drainage of the abscess to discharge from the hospital were compared in patients treated by both methods. In addition, the stage of healing at the time of discharge was compared.

## Results

Ninety-four incisional abscesses of sufficient size occurred during the 28-month period of this study. Forty-four occurred during the initial period and were allowed to granulate by secondary intention; 50 occurred during the second period when delayed closures were performed. Of these 50 only 46 were actually reclosed when the bacterial count was $10^5$ microbes or less per gram of tissue. Four were allowed to heal by secondary intention because they contained *β-hemolytic Streptococcus* (see Discussion below). Forty-two of the 46 incisions (91%) which were reclosed healed without erythema or drainage.

The average time from removal of sutures and drainage of wound infections until discharge from the hospital in wounds allowed to granulate was 22.3 days with a maximum time in one wound of 82 days (Table 1). Ninety-three per cent of the wounds so treated were not totally healed at the time of discharge and required further outpatient care.

In 42 incisional abscesses successfully reclosed following cleansing and bacterial quantification, the average time from drainage to reclosure was 4.6 days. Sutures or micropore tapes used for reclosure remained in place for an average of 5.2 days. Thus the average time from suture removal and drainage of a gross wound infection to a reclosed healed incision was

TABLE 2. *Hospital Course of 46 Reclosed Incisions*

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|---|---|
| 42 progressed to rapid healing | |
| Average time from drainage to reclosure | 4.6 days |
| Average time sutures in place | 5.2 days |
| Total average time from drainage to healed wound | 9.8 days |
| 4 Unsuccessful and required reopening | |
| Average time from reopening to complete healing | 8.8 days |
| Average time 46 patients from drainage to closed healed incision | 10.5 days |

9.8 days (Table 2). Four wounds in which reclosures were unsuccessful were redrained and third closures followed topical cleansing of the wounds. This required an average of 8.8 additional days to healed incisions. For the 46 wounds which were reclosed, the average time from drainage to a healed incision was 10.5 days (Table 2). Many of these patients were discharged with sutures in place once it was apparent that reclosure would be successful. The average time of hospitalization from drainage of the postoperative infection to discharge was 8 days (Table 1). When hospital days were compared with those allowed to heal by secondary intention the difference was statistically significant ($p < 0.01$). All patients whose incisions were reclosed were discharged from the hospital with closed wounds and required no care except removal of sutures.

## Discussion

Hampton stated that the concept that a draining septic wound should not be touched is antiquated and fallacious.[5] He pointed out that to eliminate wound suppuration and achieve healing, the wound must be free of devitalized tissue by debridement and closed by suture or skin graft at the proper time. Once contaminated nonviable tissue has been eliminated, wound suppuration will not occur, but surface infection will develop unless wounds are closed and healed. Besides being a portal for infection, Campbell demonstrated that a granulating wound is a source of protein loss and nitrogen depletion.[2] Barker *et al.*[1] quantitated protein loss from multiple granulating decubitus ulcers as 50 gm. per 24 hours.

The main objection to closing a wound once an incisional abscess has occurred is the possibility of a repeated abscess. With bacterial quantification, drained incisional abscesses have been treated as are other open wounds and the success rate is dependent upon, more than any other measurable factor, the ability to decrease bacterial count in the wound to $10^5$ organisms or less per gram of tissue.[9] This is true for all bacteria studied except the *β-hemolytic Streptococcus* which is more virulent.[10] Because of clinical and laboratory studies with this organism, it has become our practice not to close a wound in which *β-hemolytic Streptococcus* is found regardless of the numerical level. Delayed closure is also not carried out when the patient has infection elsewhere in the body because of Davis'[4] concept of "locus minor resistantiae."

Lahti[7] recently enumerated advantages of early postoperative discharge. Among these were less exposure to foreign pathogenic bacteria, more efficient use of available hospital beds, and reduced cost per patient hospitalization. In addition in the military, a patient can be returned to duty sooner; whereas in civilian life he can return to employment earlier. In the present study the time of hospitalization was reduced by 64 per cent by reclosing postoperative wound abscesses with the aid of bacterial quantification. This difference is greater in that patients reclosed were ready for a normal existence on discharge, whereas 93 per cent of those with secondary intention healing were required to perform irrigations, dressing changes, and return to the hospital as outpatients.

## Summary

A study of 94 postoperative incisional abscesses was performed to evaluate the role of bacterial quantification and early reclosure of wounds. In 44 abscesses treated by wide drainage and healing by secondary intention 22.3 days of hospitalization followed abscess drainage. In

wounds reclosed after the bacterial count was reduced to $10^5$ organisms or less per gram of tissue, 91 per cent were successful and patients were discharged from the hospital with healed wounds in an average of 8 days following drainage of abscesses. It is suggested that reclosure be performed to return an individual to his environment sooner and with economical saving.

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