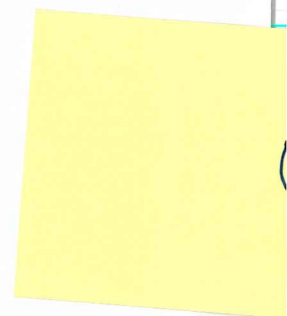


ΠΑΡΑΡΤΗΜΑ 30



Is a mask necessary in the operating theatre?

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Key words: MASKS; WOUND INFECTION

Summary

No masks were worn in one operating theatre for 6 months. There was no increase in the incidence of wound infection.

Introduction

It has been standard practice since the beginning of the century to wear a mask in the operating theatre. At that time nasal carriers were found to be important in the spread of contagious disease (1,2) and haemolytic streptococci isolated from wounds and puerperal fever were found to be identical with those carried in the throats of the surgical and obstetric teams (3,4).

Since then the prevention of wound infection has become something of an obsession and it is now obligatory to reduce the bacterial count in the theatre to an absolute minimum. Diverse and ingenious have been the manoeuvres to achieve this (5,6); among the simplest is the wearing of masks. The efficacy of masks in reducing wound infection has not been established, but their efficiency in reducing bacterial contamination has been studied in the greatest detail (7-10). From experimental evidence the hypothesis has been developed that contamination of strategically placed, inanimate, agar plates can be correlated directly with the infection of viable tissues. A simple trial has been designed to put this hypothesis to the test.

Materials and methods

The trial was carried out on patients in a 40-bedded surgical ward under the care of 2 consultants, a registrar, and a senior house officer. The ward is served by a single theatre which has few of the niceties of modern design and has open access to the main corridor. It is

staffed largely by part-time nurses, shuts daily at 5 p.m., and does not function during the weekend. During the week there is a brisk turnover of general surgery: cholecystectomies, gastrectomies, thyroidectomies, bowel resections, prostatectomies, and herniorrhaphies as well as cystoscopies, bronchoscopies, and gastroscopies. Emergencies are treated elsewhere.

Since the appointment of a control of infection sister in 1975 wound infections have been carefully monitored both from the ward and from the community. Swabs from discharging wounds are sent to the microbiologist for culture and antibiotic sensitivity testing. Wound infection in this series refers to wounds with a positive culture.

With the agreement of the microbiologist and the control of infection sister it was arranged that no masks should be worn in theatre for one month during 1980. If there was a dramatic rise in wound infection the trial would be discontinued. There was no initial rise in infection so the trial was continued and results are presented for the 6 months March-August. Nose and throat swabs were taken from all theatre personnel monthly or when they had a cold.

Wound infection rates have been compared with those of the corresponding 6 months in the previous 4 years. The whole period was monitored by the same control of infection sister, whose criteria for infection did not vary.

No restrictions in theatre were imposed on talking, movement, beards, or colds. In fact the theatre routine remained unchanged except that no one wore a mask.

Results

The throughput of the theatre remained remarkably constant over the 5 years except in 1976,

when the theatre was closed for 6 weeks for redecoration. The total throughput contained a high proportion of gastroscopies, cystoscopies, and transurethral resections. These have been excluded and only operations involving incisions have been considered (Table 1).

TABLE 1 *Throughput, wounds, and infection rates during a 6-month period (March–August) over 5 years.*

	1976	1977	1978	1979	1980
Throughput	955	1054	1046	1078	1049
Wounds	333	447	419	435	432
Infections	18	19	19	16	8
Rate %	5.4	4.2	4.5	3.7	1.8

There was no increase in wound infections when masks were discarded in 1980; in fact there was a significant ($p < 0.05$) decrease. The 8 infections which did occur (Table II) bore no relation to the throat or nose cultures from the theatre team, which from time to time yielded *Staphylococcus albus* or *Staph. aureus*.

TABLE II *Wound infections in the 6 months when masks were not worn.*

Operations	No	Infecting organism(s)
Abdominoperineal resection	2	<i>Escherichia coli</i> <i>Proteus</i> <i>Enterococcus</i>
Bowel resection	2	<i>Pseudomonas pyocyanea</i> <i>E. coli</i>
Colostomy	1	<i>E. coli</i>
Gastrectomy	1	<i>E. coli</i>
Prostatectomy	1	<i>E. coli</i>
Incisional hernia	1	<i>Proteus</i>

(In 74 inguinal hernia repairs with monofilament nylon darns no infections were reported).

Discussion

A review of the very considerable literature on prevention of infection in theatre shows a heavy bias in favour of history and hypothesis. Most of the facts relate to contamination, not infection.

The effectiveness of a mask in reducing contamination varies with the mask's shape, the materials of which it is made, and the way it is worn (10–11). While it has been shown that facial movements behind a mask can increase wound contamination (12), it has not been shown that wearing a mask makes very much difference to the contamination of the theatre environment (13) or that the number of airborne bacteria can in any way be correlated with wound infection (14,15). It would appear that minimum contamination can best be achieved

by not wearing a mask at all but operating in silence. Whatever its relation to contamination, bacterial counts, or the dissemination of squames, there is no direct evidence that the wearing of masks reduces wound infection.

Recommendations on theatre design and standard procedures have been drawn up by a series of distinguished committees and in this litigious age it ill behoves the surgeon to ignore them. But from time to time it is salutary to see history in perspective, put hypothesis to the test, and confirm that experimental evidence is in fact appropriate.

The results of the relatively simple trial reported here could easily be repeated and it would be interesting to see whether comparable results are obtained in emergency, orthopaedic, or other general surgical theatres. The finding that there was an appreciable fall in the wound infection rate when masks were not worn certainly warrants further investigation. This trial was designed only to see whether wound infection increased, as had been predicted, when masks were not worn. It did not. The conclusion is that the wearing of a mask has very little relevance to the wellbeing of patients undergoing routine general surgery and it is a standard practice that could be abandoned.

References

- 1 Hamilton A. Dissemination of streptococci through invisible sputum in relation to scarlet fever and sepsis. *JAMA* 1905;44:1108–11.
- 2 Teague O. Some experiments bearing upon droplet infection in diphtheria. *J Infect Dis* 1913;12:398–414.
- 3 Meleney FL, Stevens FA. Postoperative haemolytic streptococcus wound infections and their relation to haemolytic streptococcus carriers among operating personnel. *Surg Gynecol Obstet* 1926;43:338–42.
- 4 Paine CG. The aetiology of puerperal infection, with special reference to droplet infection. *Br Med J* 1935;i:24–6.
- 5 National Research Council (Ad Hoc Committee). Postoperative wound infections. *Ann Surg* 1964;160(Suppl):1–132.
- 6 Charnley J, Eftekhari NS. Postoperative infection in total prosthetic replacement arthroplasty of the hip joint, with special reference to the bacterial content of the air of the operating room. *Br J Surg* 1969;56:641–9.
- 7 Hirshfield JW, Laube PJ. Surgical masks, an experimental study. *Surgery* 1941;9:720–30.

- 8 Greene VW, Vesley D. Method for evaluating effectiveness of surgical masks. *J Bacteriol* 1962; 83:663-7.
- 9 Ford CR, Peterson DE. The efficiency of surgical face masks. *Am J Surg Pathol* 1963;106:954-7.
- 10 Quesnal LB. The efficiency of surgical masks of varying design and composition. *Br J Surg* 1975; 65:936-40.
- 11 Hambræus A, Laurell G. Protection of the patient in the operating suite. *Journal of Hospital Infection* 1980;1:15-30.
- 12 Schweizer RT. Mask wiggling as a potential cause of wound contamination. *Lancet* 1976;2:1129-30.
- 13 Ritter MA, Eitzen H, French V, Hart JB. The operating room environment as affected by people and the surgical face mask. *Clin Orthop* 1975;(111):147-50.
- 14 Shaw D, Doig CM, Douglas D. Is airborne infection in operating theatres an important cause of wound infection in general surgery? *Lancet* 1973;1:17-20.
- 15 Bengtsson S, Hambræus A, Laurell G. Wound infections after surgery in a modern operating suite: clinical, bacteriological and epidemiological findings. *J Hyg (Camb)* 1979;83:41-56.

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