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# Polyethylene oxide gel: A new dressing after endoscopic sinus surgery

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SUMMARY

*The purpose of dressings after endoscopic sinus surgely is to absorb secretions, tamponade bleeding, discourage adhesions, andfacilitate sinus and nasal hygiene. The ideal dressing should conform to the irregularities of the nasal-sinus cavity and resist adherence to the wounds so it can be easily removed. It should be economical, non-irritating, and antiseptic.*

*The failure of previous dressings to fulfil! all of these criteria led the author to evaluate a new alternative. Polyethylene oxide gel (Vigilon®) was identified as a potential improvement and investigated in a clinical trial of 60 cases. This paper presents the author's observations and techniquefor application. Polyethylene oxide gel resulted in no significant complications. It appears superior to previously described dressings, primarily because ofpatient comfort at removal.*

## INTRODUCTION

Based on the principle of establishing an open ostiomeatal complex, endoscopic sinus surgery has become a commonly performed procedure. Important to the success of endoscopic surgery is effective postoperative care (Stankiewicz, 1987; Rice, 1989). A neglected operative site may foster inflammation, infection, mucosal swelling, coaptation of raw surfaces, adhesions, and reobstruction of the "opened" ostiomeatal complex.

There are two schools of thought regarding care during the postoperative period. One school recommends the use of intranasal dressings or "spacers" (Stankiewicz, 1987; Lusk and Muntz, 1990). The other recommends frequent cleaning without the use of dressings (Messerklinger, 1985). It is not the purpose of this paper to debate this issue.

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Instead, a new dressing is presented for those who favour the use of dressings. Polyethylene oxide gel (POG) was first introduced in the early 1980s (Vigilon®, Spensco Surgical Dressing) as an absorbent, occlusive wound dressing to promote superficial wound healing by secondary intention (Geronemus and Robins, 1982; Mandy, 1983; Yates and Hadfield, 1984).

POG is a colloidal suspension of irradiated cross-linked polyethylene oxide and water (96% water, 4% polyethylene oxide). It is supplied as a transparent 1 mm thick gelatin-like layer, sandwiched between two thin occlusive polyethylene films. POG is permeable to water vapour, oxygen, and carbon dioxide. It has the ability to absorb twice its weight in exudative fluid. It is non-adherent to raw or moist tissues because it will not incorporate into a fibrin or platelet clot. It can be removed and replaced without disturbing the delicate initial processes of wound healing.

This paper presents the author's experience and technique used in applying POG dressing after endoscopic sinus surgery and discusses the advantages of POG over other commonly used dressings.

## MATERIALS AND METHODS

POG dressing after endoscopic sinus surgery was used in 60 cases (60 sides in 33 adult patients) from April 1989 through April 1990. The first 35 cases were studied retrospectively; the last 25 were evaluated prospectively with a brief questionnaire (Figure 1).

### VIGILON CASE STUDY

Pt name: _____
Clinic no.: _____
Date: _____
Procedure:----------
Surgeon: _____

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dressing removed | __ | Hours postop | __ | Days postop | | | | |
| Discomfort on removal | __ | None | __ | Slight | __ | Moderate | __ | Bad |
| | __ | Very bad | | | | | | |
| Bleeding | __ | None | __ | Few drops | __ | Many drops | | |
| | __ | Brisk | | | | | | |
| Duration | __ | Minutes | | | | | | |
| Infection | __ | None | __ | Scant purulence | __ | Gross purulence | | |
| | Culture _____ | | | | | | | |
| Reinserted Vigilon | __ | Yes | __ | No | | | | |
| Reason | -- | Bleeding | -- | Support/prevent adhesions | | | | |

Figure 1. Vigilon case study questionnaire. (Frorn Salassa JR, Pearson BW. Polyethylene oxide gel: A new intranasal dressing after septorhinoplasty. Arch Otolaryngol Head Neck Surg 1991; 117: 1365-1367. By permission of Mayo Foundation.)

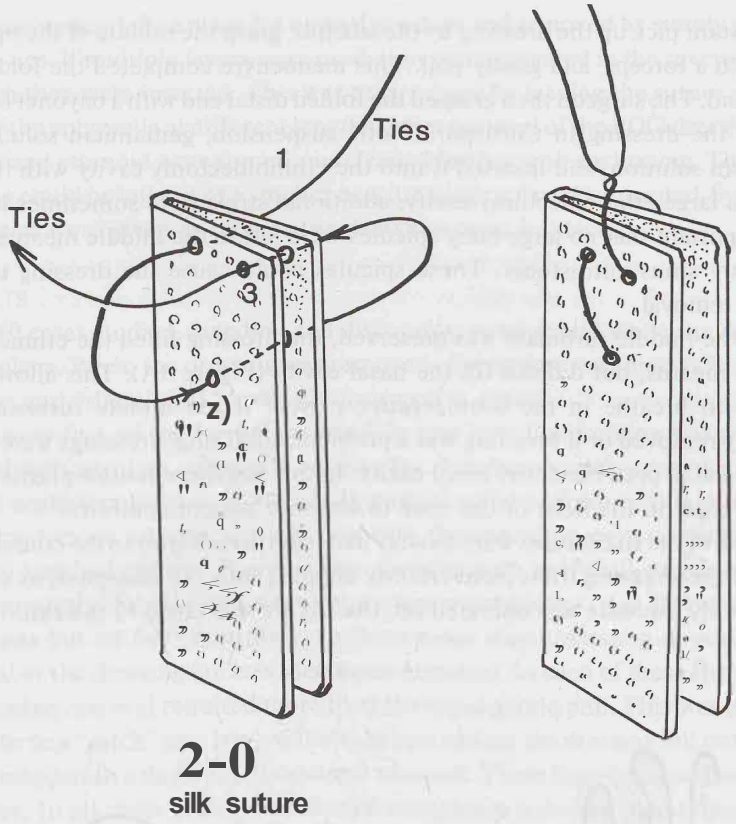


Figure 2. Figure-of-eight suture through 1 x 4 inch Vigilon® strip folded lengthwise with gel side out. (From Salassa JR, Pearson BW. Polyethylene oxide gel: A new intranasal dressing after septorhinoplasty. Arch Otolaryngol Head Neck Surg 1991; 117: 1365-1367. By permission of Mayo Foundation.)

In this study, POG in the "non-sterile" 4 x 4 inch package($ 2.00 per package) was used. The 4 x 4 inch sheet was cut into strips 1 inch wide and 2 to 4 inches long. After this step, it was important to wet instruments, gloves, and other objects that came in contact with the gel. Dry objects would stick to the gel and make the following steps difficult.

The thin occlusive polyethylene film was peeled back 1 inch from the end of one side, exposing the gel. Each strip was then folded lengthwise with the gel on the outside and the opposite occlusive sheet on the inside. A 2-0 silk suture was passed through the gel end of the folded strip in a figure-of-eight stitch and tied (Figure 2). The ends of the silk sutures were left 3 to 4 inches long. The remaining occlusive sheet on the outside (gel side) of the folded strip was then removed. The folded and sutured ½ inch strip dressing was difficult to handle, similar to picking up a piece of gelatin with wet hands. This problem was solved by having

an assistant pick up the dressing by the silk ties, grasp the middle of the opposite end with a forceps, and gently pull. This manoeuv.re completed the fold at the distal end. The surgeon then grasped the folded distal end with a bayonet forceps, dipped the dressing in Cortisporin® otic suspension, gentamicin solution, or iodoform solution, and inserted it into the ethmoidectomy cavity with the fold up. In a large ethmoidectomy cavity, additional strips were sometimes used. It was important that no large bony spicules were left in the middle meatus or the maxillary sinus antrostomy. These spicules could cause the dressing to snag during removal.

When the middle turbinate was preserved, the dressing filled the ethmoid and middle meatus, but did not fill the nasal cavity (Figure 3A). This allowed the patient to breathe in the postoperative period. If the middle turbinate was partially removed or if bleeding was a problem, additional dressings were sometimes used to pack the entire nasal cavity. In this situation, hollow plastic straws were placed on the floor of the nose to enhance patient comfort.

The ends of the silk sutures were loosely tied together anterior to the columella to prevent the dressing from inadvertently slipping into the nasopharynx (Figure 3B). If only one side was operated on, the silk tie was taped to the external ala.

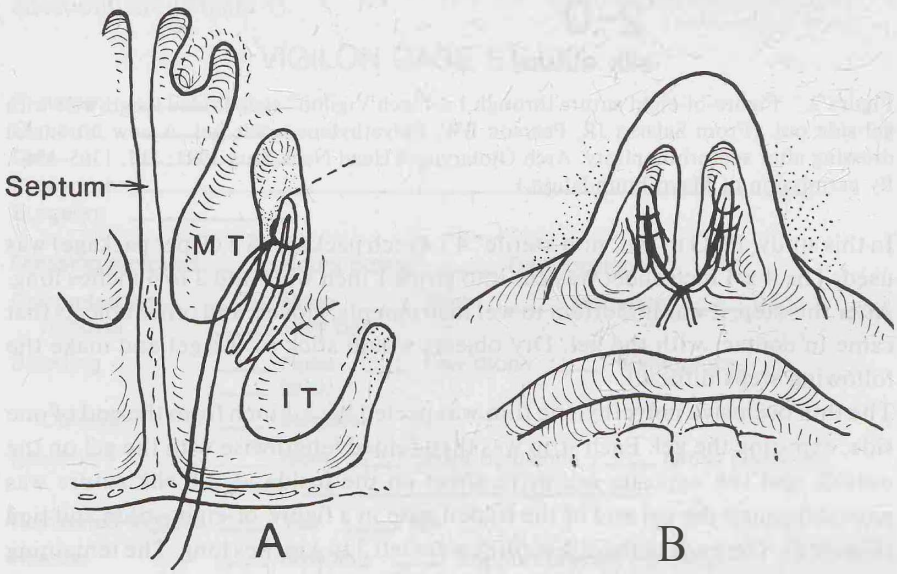


Figure 3. Vigilon® in place with suture tied at columella. (B, From Salassa JR, Pearson BW. Polyethylene oxide gel: A new intranasal dressing after septorhinoplasty. Arch Otolaryngol Head Neck Surg 1991; 117: 1365-1367. By permission of Mayo Foundation.)

The dressing was left in place for up to three days and removed by simply pulling the silk ties. If multiple layers were used, they were removed in the reverse order in which they were inserted. This was prearranged by leaving the suture ends in front of the columella at different lengths. After removal of the POG dressing, the antrum and ethmoid were sometimes cleaned further with suctioning. The POG dressing could be left out or a smaller new dressing replaced, as needed. Systemic antibiotics were given as long as the dressings were in place.

## RESULTS

In the 60 cases studied, bleeding and discomfort were absent while the dressing was in place. When the dressing was removed, discomfort was rated as "none" in 15 cases and "slight" in 10 cases (25 prospective cases).

There were five minor "complications." In one case the dressing was partially covered with purulent secretions positive for *Pseudomonas* after removal on the second postoperative day. This elderly patient suffered from multiple medical problems (severe asthma, chronic hepatitis, thrombocytopenia, cardiovascular disease) and had chronic *Pseudomonas* sinusitis with polyposis preoperatively. Postoperatively, he required steroids, systemic antibiotics, and frequent sinus irrigations but no further surgery. In three cases slight bleeding developed on removal of the dressing (all less than three minutes). In each of these three cases the dressing removal required more than the usual gentle pull. This was thought to be due to a "catch" on a bony spicule. In one patient the dressing fell out on the third postoperative day when the patient sneezed. There have been no long-term sequelae. In all cases the middle meatal complexes have remained open.

## DISCUSSION

Patient discomfort, bleeding, hypoxia, difficult removal, posterior displacement, poor nasal-sinus hygiene, bacterial colonization, toxic shock, non-specific inflammation, frequent postoperative visits to the physician, and adhesions are reported to occur with varying degrees of frequency when intranasal dressings are used. Antibiotic-impregnated petrolatum (Vaseline) gauze strips are perhaps the oldest and most widely used dressings. The narrow strips allow accurate placement. They conform well to the irregularities of the nasal-sinus walls and their porous nature absorbs secretions. Their major disadvantage is adherence. Removal is decidedly uncomfortable and not infrequently causes bleeding. Some surgeons advocate leaving the gauze packing in place for 5 to 10 days to decrease the discomfort and bleeding (Freedman and Kern, 1979). Others are uncomfortable leaving the packing in place for a week because of infection and the rare possibility of toxic shock syndrome (Jacobson and Kasworm, 1986; Nahass and Gocke, 1988). Owen's silk (Johnson, 1986) and Telfa dressings (Kamer and Parkes, 1975; Taylor et al., 1982) have been advocated by oihers as less adherent

and, therefore, as causing less discomfort and bleeding when removed. Surgical sponges (Doyle and Stoller, 1983), like gauzes, are u_ncomfortable to remove and often result in bleeding. Placing petrolatum gauze within a rubber finger cot eliminates adherence; however, such dressings are non-conforming and non-absorbent, and accurate placement is difficult. The use of absorbable dressings such as gelatin (Gelfoam®) (Taylor et al., 1982), oxidized cellulose (Oxycel®) (Fanous, 1980), and collagen products (Dailey and Wobig, 1988) is attractive in theory. However, in practice they often form hard crusts which may take weeks to dissolve. These crusts are themselves associated with inflammation, and their removal can be difficult and painful. Oxidized cellulose is also acidic, and an irritant to the sinus mucosa.

Non-absorbable ointments such as antibiotic-petrolatum ointment (Messerklinger, 1985) fill the sinus cavities and prevent crusting. However, such ointments are non-absorptive, do not tamponade bleeding, provide no internal splinting (spacer), and require frequent postoperative cleaning. Aspiration of the petrolatum (Becker, 1983) is an additional concern.

POG is absorptive and non-adherent. Studies done on superficial wound healing (skin) show that POG enhances reepithelialization, decreases the dermal inflammatory response, promotes fibroblast proliferation, decreases the zone of dermal fibrosis, and increases dermal collagen synthesis. Healing time is decreased by up to 50% compared to dry dressings (Geronemus and Robins, 1982; Wheeland, 1987). POG is not toxic to tissues and hypersensitive reactions are rare.

This study demonstrated that POG, used as described, is a well-tolerated dressing after sinus surgery. Success in preventing adhesions or stenosis in the middle meatal complex seems to be dependent on its function as a spacer between opposing raw surfaces and its ability to promote nose and sinus hygiene and healing. Bacterial colonization is prevented by changing the POG dressing every three days until healing occurs. Because of its non-adherent qualities, POG (unlike other dressings) can be removed and reinserted without disrupting the delicate early processes of wound healing as evidenced by minimal patient discomfort and bleeding.

A theoretical disadvantage of POG is the potential for causing infections. A significant increase in bacterial counts in cutaneous wounds, especially *Pseudomonas,* has been shown after 48 to 96 hours (Leaper et al., 1984; Mertz et al., 1985; Katz et al., 1986).

Antibiotic-antiseptic-impregnated POG can decrease these counts (Mandy, 1985; Mertz et al., 1986). Despite these increased counts, an increased infection rate was not observed in skin wounds when the dressing was changed every two to three days (Yates and Hadfield, 1984). These findings are not unique to POG but common to any occlusive wound dressing. Similar findings using petrolatum gauze for nasal packing have been reported (Herzon, 1971; Detkay et al., 1989).

## CONCLUSIONS

POG was used in 60 endoscopic sinus surgery cases and found to be an effective, reliable, and comfortable dressing associated with an extremely low complication rate. POG appears to be superior to previously used dressing materials (petrolatum gauze, Owen's gauze and Telfa impregnated with antibiotic ointment, finger cots stuffed with gauze, Gelfoam®, and plain antibiotic-petrolatum ointment). The major advantage of POG compared to other dressings is the lack of discomfort and bleeding when the dressing is removed and the ease of reinsertion of a second dressing when appropriate to prevent adhesions. POG comes close to meeting all the criteria of an ideal postendoscopic sinus surgery dressing. It absorbs secretions, tamponades bleeding, prevents adhesions, and facilitates sinus and nasal hygiene. Additionally, it conforms to the irregularities of the nasal cavity and is easy to insert and remove. It is economical and readily available, and infection and irritation are rare. In the author's practice, POG has become the dressing of choice for nasal or sinus surgical procedures.

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