

# Postoperative contamination of mandibular osteotomy sites with saliva

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**ABSTRACT** – Postoperative salivary contamination of surgical wounds around the mandible was found in several types of osteotomy and bone grafting procedure. This problem was investigated by determining the amylase content of wound secretions in redon bottles every 24 h. The implications for antibiotic prophylaxis are discussed.

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Continuous suction is practiced frequently after osteotomies and other oral surgical procedures in order to eliminate accumulation of secretions. It may have the disadvantage that saliva is drawn into the field of surgery as long as the seal towards the oral cavity is not “water-tight”. In this paper, we report on an investigation into this problem. The amylase content of the secretions obtained from surgical wounds, primarily open towards the oral cavity, was determined in several types of osteotomy and bone graft procedure. The results of osteotomies and ridge augmentation of the visor-sandwich type will be reported in this paper.

It was assumed that the amylase content of the secretions in the suction redon bottles was an indication of saliva leakage into the field of surgery, if elevated values (as compared to the plasma level) were obtained.

## Material and methods

The several types of osteotomy and bone graft procedure in 34 patients are depicted in Fig. 1.

Drains of the redon-type were inserted and bottles were examined daily until the drains could be removed, as secretion was reduced to an insignificant level. Because of the continuous suction drainage, extra efforts to prevent leakage were taken, including strapping of the lower lip (Fig. 2), gastric tube feeding in some cases, and careful handling of the surgical site during cleaning of the mouth.

Measurements of the amylase content were performed with the Phadebas method\*. Normal serum amylase values are between 100–350 U/l, independent of factors such as food intake, diet, muscle activity and haemolysis<sup>13</sup>. It was assumed that an amylase content between 350 U/l – 1000 U/l after the 2nd day was probably due to minor salivary leakage into the wound. A content between 1000–5000 was likely to be caused by a

\*Pharmacia Diagnostics AB, Uppsala, Sweden.

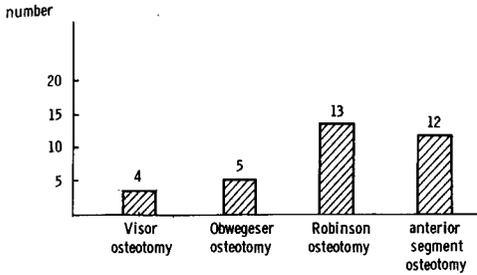


Fig. 1. Patient material.

considerable leakage and amounts larger than 5000, point to a major dehiscence of the wound, viz, 2 upper dots in Fig. 3 at days 2 and 3.

**Results**

The first 3 days values are depicted in Fig. 3. The drawn and interrupted lines represent averages. The separate marks (29 esti-

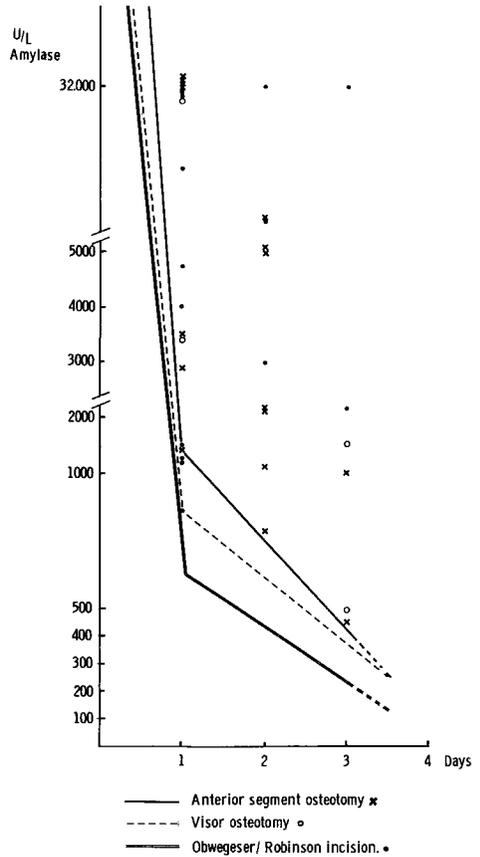


Fig. 3. Amylase content of secretions; for explanation see text.

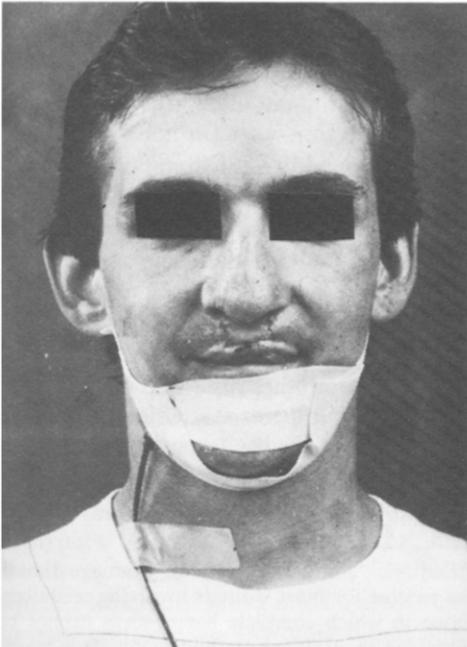


Fig. 2. Strapping and drain in a patient with an anterior segmental osteotomy.

mations out of a total of 106) represent the above average values. After post-operative day 3, the secretions as a rule diminished such that the drains were removed. Elevated contents were found in 2 out of 4 visor osteotomy cases, in 5 out of 18 oblique subcondylar osteotomy Obwegeser-Dal Pont cases and in 8 out of 12 anterior segmental osteotomy cases.

As can be seen, it is especially in the anterior segment type of osteotomy that an elevation of the amylase content was found after the first postoperative day.

From Fig. 3, it also becomes clear that even the higher levels of amylase content

Table 1. Some published results from the Utrecht clinic for Maxillo-facial Surgery

Type of surgery	No. of patients	% infection
oblique subcondylar osteotomy <sup>6</sup>	100	6
segmental anterior (Hofer) <sup>11</sup>	18	0
segmental anterior (Köle) <sup>12</sup>	44	0
major mandibular reconstructions <sup>7</sup> (free bone grafts)	38	26.3*

\*Total graft loss in 3 patients (7.9%).

tend to decrease, but they may reach serum levels only after a period beyond 3 days, if suction were continued.

## Discussion

Our findings may have some implications with regard to the duration of antibiotic prophylaxis. They may indicate that contamination of the surgical field with saliva occurs at least up to the 3rd postoperative day. It is assumed that the amylase content of the first sample is caused by saliva introduced into the wound during surgery. Significance can therefore only be attached to the amylase content of the secretions after the first day, provided the parotid or other gland(s) have not been damaged secreting saliva into the field of surgery. Especially where a bone graft is at risk of being lost, one should therefore consider antibiotic prophylaxis well beyond this time. Whether one could manage patients by taking daily samples of fluid collected in the redon-system and having them examined on their amylase content seems still debatable to us. A more rational approach seems to be to "defend" the osteotomy site routinely against infection for at least a week. This statement is not in accordance with modern trends in general surgery where short-term prophylaxis seems to prevail nowadays<sup>3,17</sup>.

The wound infection rates in maxillo-facial surgery, being much higher than in other surgical specialties (see below), seem, however, to warrant such a basically different approach.

It is, however, clear that in view of our findings, the use of suction drainage should be questioned. Is it necessary/useful to drain osteotomy sites? The object of course is to eliminate dead space and obtain a rapid adaptation of the covering soft tissues to the underlying bone, especially in cases where bone grafts have been used. Since up to 200 ml of secretions can be found occasionally in a vacuum bottle after 24 h (even in anterior segmental osteotomies), the argument in favour of continuous suction drainage seems to have a certain logic. It seems unlikely that such large amounts of secretions/blood can be resorbed in a few days. However, we have never conducted a comparative study on 2 groups (one with, one without continuous suction) with regard to wound infection.

We can therefore only point to the general surgical principle as outlined above in favour of our practice and also to common practice in orthopaedic bone surgery\*, especially where free bone grafts are inserted. Finally, as already indicated above we can also point to the high infection rate of mandibular osteotomies (up to 21.7%) reported by some<sup>1,2,20</sup>, not to speak of the high infection rate in mandibular reconstruction as reported by others<sup>7,16,19</sup>. Our own results for wound infections are presented in Table 1.

\*Smith<sup>18</sup>: "The use of suction drainage should be routine for most wounds involving medullary bone in which complete haemostasis cannot be obtained by ordinary methods, wounds in which there is a dead space, and after most major operations on the hip or spine".

As to the question of whether leakage of saliva can be equated with the increased likelihood of infection, the following considerations seem relevant. Saliva is sterile as it is secreted, but in the oral cavity, the bacterial count in 1 ml of whole saliva is  $10^7$  aerobic micro-organisms plus  $5 \cdot 10^8$  anaerobic ones<sup>10</sup>. Many species found in saliva are also found in infections after head and neck surgery<sup>14</sup>. Clearly, saliva entering a wound through a dehiscence in the suture line may be assumed to contaminate the osteotomybone graft site producing infection if the local and general circumstances for its development are favourable.

Are there other ways in which saliva could be operative inside a wound? In addition to bacteria, saliva contains several constituents which might in theory be of importance in oral infections. We will discuss 2 of them. Lysozyme in combination with complement has bactericidal activity. However, it is inactive against the normal oral flora<sup>21</sup>. It could theoretically be active against contaminant germs, which circulates in hospitals, and as such be of some value in preventing infection with, say, one or another gram-negative rods. This, however, is purely speculative. Fibrinolysins and their inhibitors are found in saliva. Fibrinolysis can destruct a blood clot, and also the clot in or around an osteotomy site. These substances are thought to play a rôle in post-extraction alveolitis<sup>5,15</sup> but local plasminogen activators seem to be more important than salivary fibrinolytic agents<sup>4</sup>, and fibrinolytic inhibitors in normal whole saliva seem to have no physiological importance at all<sup>8</sup>. Moreover, it has not been possible to reduce the incidence of alveolitis by applying a local fibrinolytic inhibitor<sup>9</sup>, and therefore, all in all, it seems doubtful whether leakage of saliva into an osteotomy or bone graft site has any other significance than of being a vehiculum for oral bacteria.

The final answer to the problems in-

olved seems to be the conduction of a comparative clinical study. For ethical reasons, such a study can hardly be set up by such "believers" as the authors of this paper.

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