

Post-operative Complications in Pharyngeal Flap Surgery

BENGT NYLÉN, M.D.

ÅKE WÄHLIN, M.D.

Stockholm, Sweden

In surgery involving the oral cavity, generally, the close proximity of the airways offers abundant possibilities of respiratory complications. This is particularly the case regarding surgical procedures in the pharynx. Much attention has always been given to the refinement of surgical techniques and anesthesiological measures with the prospect of eliminating respiratory complications arising both during and after the operation as well in the post-operative period. Yet, in spite of all the care taken, complications do occur, especially during the post-operative period.

In the present paper, a large series of pharyngeal flaps is discussed regarding post-operative complications and anesthesiological techniques.

Brief Historical Survey

A review of the technique of the pharyngeal flap is presented elsewhere (11). Schönborn (14), the originator of both upper- and lower-based pharyngeal flaps, performed his first operation of this kind in 1874. In 1886 (15), he reported on 20 pharyngeal flap cases. There was one death in that series, from pneumonia. Kindler (3) reported on four cases of pharyngeal flap operations. One patient died, from mediastinitis, probably due to infection in the upper respiratory tract.

Thanks to modern anesthesiological methods and also to the availability of chemotherapeutic and antibiotic agents, there has been a remarkable decline in the frequency of serious complications arising in connection with surgical procedures in the pharynx, such as deaths from pneumonia, while at the same time the number of operations has greatly increased (16). The trend for such a decline is evidenced from the results of a study by Musgrave and Bremner (10). In that series of 780 cases of cleft palate and pharyngeal flap operations two deaths occurred, one being that of a 23-month-old child. The death in this case was due to surgical factors, namely unreplaced blood loss probably associated with some degree of asphyxia.

REPORTED TYPES OF COMPLICATIONS. Deficient primary healing is a

Dr. Nylén is Clinical Assistant Professor of Plastic Surgery and Dr. Wåhlin is Clinical Assistant Professor of Anesthesiology, Karolinska Hospital, Stockholm.

possible source of post-operative complications as reported by Musgrave and Bremner (10) in 7.7% of the cases, by Owsley and Blackfield (13) in 6%, and by Nylén (11) in 7.5%. However, one of the most important causes of respiratory complications in close connection with pharyngeal flap surgery is bleeding, which can lead to airway obstruction and other obstructive mechanisms caused by traumatic or infectious swellings in or in close proximity to the airways.

In a series operated upon almost exclusively by means of pharyngeal flaps, bleeding is reported by Owsley and Blackfield (13) in 8% of 79 cases and by Nylén (11) in 9% of 33 cases. Mechanisms other than free bleeding leading to airway obstruction are reported by Owsley and Blackfield (13) in 4% of 79 cases and by Nylén (11) in 3% of 33 cases.

Infections in connection with operations have also occurred during the last few years, despite the availability of antibiotics. Walden and associates (17, 18) present in their material two instances of infection causing death: in one case, streptococcal throat infection, and in the other case, meningitis. Musgrave and Bremner (10) report that upper respiratory infections occurred in 3.1% of the cases.

Ear complications following pharyngeal flap surgery are rare, despite a high frequency of anamnestic data concerning earlier infections or chronic otitis media and pathological ear findings (11, 13, 16).

VARIOUS PROPHYLATIC MEASURES AGAINST COMPLICATIONS. Apart from the fundamental measure of carefully watching over the breathing in the post-operative stage, Walden and associates (17, 18) consider tracheotomy to be of definite value for better control of bleeding and airway obstruction. Musgrave and Bremner (10) and Owsley and Blackfield (13) recommend a surgical silk suture in the tongue to prevent airway obstruction. In order to avoid the danger of infection upon opening the prevertebral space, Longacre and DeStefano (7) kept the patient in shock position in the post-operative period and administered nothing by mouth for five days. They saw no signs of infection in their series of 52 patients. With the aim of preventing infection, penicillin has been used in cleft palate and pharyngeal flap surgery and has proved to be of value, as can be inferred directly from the primary healing (8, 9). Jolleys and Savage (2) found deficient healing in 10% to 15% of their cases, where infection probably played the most important role.

Present Findings

The series, collected between 1962 and 1964, consists of 103 cases of pharyngeal flap surgery. An upper-based flap was made in all except two cases. The operation has been described in detail by Nylén (11). Distribution of age for the 103 subjects was as follows. Of the 14 who had not been previously operated, eight were between the ages of 10 to 30 years and six were between the ages of 31 to 59 years. Of the 89 who had been previously operated, 26 were between the ages of five to 10 years, 46

TABLE 1. Post-operative observations.

<i>Observation</i>	<i>N</i>	<i>%</i>
Healing per primam	85	82.5
Healing after one or two revision operations	100	97
Fistula in the soft palate region	11	10.6
Fistula closed after one revision operation	6	5.7
Fistula closed after two revision operations	5	4.9
Remaining insignificant fistula	2	1.9
Flap detached totally or partially	5	4.9
Flap operation successful after reoperation	4	3.9
Flap still detached after reoperation (due to repeated haemolytic streptococcal infection in pharynx)	1	1

were between the ages of 11 to 30, and 31 were between the ages of 31 to 59. Of the 103, 14 had VY retroposition and pharyngeal flap and 89 had pharyngeal flap only. There was approximately even distribution in the group for sex.

Various post-operative observations are presented in Table 1. In 89 cases of 103 (86%), the post-operative period passed without any complications. Apart from the reported local complications in healing, bleeding in the immediate post-operative period occurred in the remaining 14 cases (14%). These cases are further analyzed below.

POST-OPERATIVE BLEEDING (14 CASES).

Bleeding during First Post-operative Days (11 Cases). Seven cases recovered after suction, cleaning, and/or blood transfusion. In the remaining four cases, tracheotomy was performed; one of these patients died.

Bleeding during Fourth to Tenth Days (3 Cases). All recovered after suction, cleaning, and in one case, blood transfusion.

Tracheotomy after Bleeding (4 Cases).

A. The first subject, a 58-year-old woman with subtotal cleft of the secondary palate (soft palate), was not previously operated on. A VY retroposition operation was performed in combination with an upper-based pharyngeal flap, 5 cm long and 2 cm wide. During the operation, bleeding was rather marked. The patient received 1000 ml blood during the procedure. In the post-operative period, she had moderate bleeding from the operative region. Pulmonary roentgen films showed diffuse spots on the right side. Because the patient had breathing difficulties, a tracheotomy was performed on the first post-operative day. Following this, her breathing quickly returned to normal and later the lung fields cleared, according to roentgen films. Her general condition was much improved and the tube was removed on the seventh post-operative day. The healing of the palate was uneventful.

B. The second patient, a 14-year-old boy had a short palate and marked cleft palate speech. He had been operated on 18 months previously and an upper-based pharyngeal flap had been performed. There were no complications in the immediate post-operative period, but at the follow-up the flap

had become detached and the patient was readmitted for the provision of a new pharyngeal flap. The operation was performed in the usual way. The flap was 4 cm long and 2 cm wide. There was moderate bleeding during the operation. In the post-operative period the patient had continuous, rather marked bleeding. He aspirated some blood and was therefore reintubated three hours after the operation. An artery on the right side of the posterior pharyngeal wall was ligated and tracheotomy was performed. After this, the bleeding stopped and the patient's breathing greatly improved; pulmonary roentgen films showed signs of atelectasis, which diminished quickly during the next few days. On the eighth day, the tube was removed. The healing was uneventful.

C. The third patient, a 41-year-old woman had an unoperated total cleft of the secondary palate with an obturator. She was gradually losing her teeth and had difficulties in fixing her obturator. A VY retroposition operation was performed in combination with the provision of an upper-based pharyngeal flap. Relatively abundant bleeding occurred during the operation. Careful hemostasis was carried out. In connection with the extubation, there was bleeding from the posterior pharyngeal wall and it became necessary to reintubate. Tracheotomy was considered. The bleeding was totally stopped and another extubation was tried, but this caused the bleeding to reoccur. Thereafter tracheotomy was performed. The total blood loss during the operation was estimated at 1400 ml. The blood loss was replaced by blood transfusions. The post-operative course was completely uneventful and the tracheal cannula was withdrawn on the fifth day. The primary healing was quite normal.

D. The fourth patient, a 7-year-old girl, was born with multiple congenital deformities involving subtotal cleft of the secondary palate, umbilical hernia, pes plano valgus bilaterally. Her palate had been operated upon when she was one year old. She was mentally retarded and started school in a special class. A hearing defect of moderate degree had been found. Because of this hearing defect and very marked cleft palate speech coupled with the mental retardation, she was supplied with a hearing aid and it was also thought that a pharyngeal flap could improve her speech considerably. When seen, she was in good general health. She seemed young for her age and had hypertelorism, epicanthus bilaterally, and right-sided moderate ptosis. She was operated upon for the provision of an upper-based pharyngeal flap. The operation was quite uneventful. In the immediate post-operative period she was rather sleepy.

Approximately four and one-half hours after the conclusion of the operation a sudden state of shock was noted, despite continuous and competent observation of the patient. In close connection with the loss of consciousness, large amounts of old blood were vomited and aspirations occurred. The child was reintubated and the airways were cleaned by suction. After tracheotomy and blood transfusion, the child recovered fairly rapidly and became conscious again. Inspection of the operation field revealed no reason for further surgical intervention. Antibiotics were administered.

During the next three to four days, the situation was complicated by the formation of crusts in the airways. The crusts were removed by bronchoscopy. The fluid balance was carefully observed. In spite of having fairly free airways without crusts, however, the patient became increasingly cyanotic and was attached to a respirator. Pulmonary oedema developed. The body temperature increased. In spite of effective ventilation with oxygen, the child became cyanotic and reacted less and less well to therapy. Despite

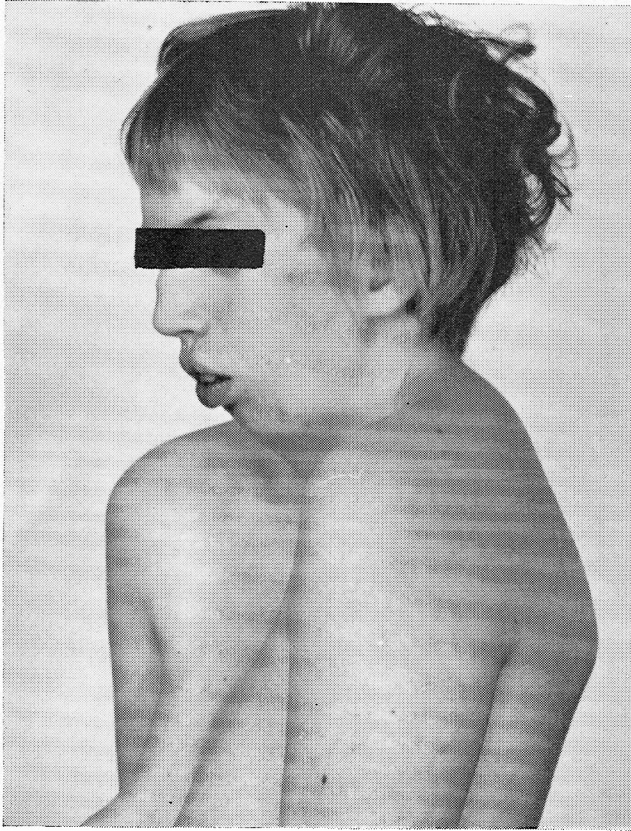


FIGURE 1. Twenty-two-year-old girl with multiple deformities including microgenia, atresia of the right outer auditory canal, short neck (Klippel-Feil's syndrome), and thoracic deformities. Due to difficulties to intubate her to operate her subtotal cleft of the secondary palate, tracheotomy was performed before the operation.

intensive care, the patient died after two weeks, the picture being one of heart insufficiency.

The section showed chromosome aberration (deletion in the group 17-18), palatoschisis post-operative with status post tracheotomiam and tracheo-bronchitis ulcerosa, a slight defect in the ventricle septum and pulmonary oedema and stasis, acute insufficiency of the right heart with venous blood congestion in the liver and fatty degeneration.

A Case on the Borderline of Tracheotomy. In addition to the series of tracheotomized cases the following case seems worthy of note. It clearly shows the role that bleeding plays in the immediate post-operative period.

A 41-year-old man with a large defect in the soft palate following operations in childhood had an obturator that measured about 600 mm². He was headmaster of a school and with the obturator his speech was normal. He

was, however, gradually losing his upper teeth and difficulty in retaining his obturator could be expected to occur in the future. A large pharyngeal flap was therefore sutured to the soft palate. There was little bleeding during the operation, but when the patient was extubated he started to cough. Bleeding then started and there was danger of suffocation. The patient was therefore reintubated. Some time after this he was extubated again, following suction of the operated area. There was no bleeding and the second extubation had no adverse effects. The healing of the flap was uneventful and at the follow-up the patient's speech was considered normal.

Tracheotomy Due to Congenital Malformation of the Jaws. In one case it was necessary to perform tracheotomy because of difficulties in intubating the patient due to congenital malformations, above all in the jaws.

The patient was a 22-year-old woman, who had multiple congenital deformities, including subtotal cleft of the secondary palate, microgenia, atresia of the right outer auditory canal, short neck (Klippel-Feil's syndrome), thoracic deformities (funnel-shaped chest, scoliosis and scapula superior to its normal position) (see Figure 1). An attempt to intubate in the usual way failed. Tracheotomy was therefore resorted to and a VY retroposition operation with provision of a pharyngeal flap was performed. Owing to the marked microgenia oral surgery was very difficult and it was not possible to obtain any mucosal cover on the nasal and oral side in the anterior part of the palate. The post-operative course was uneventful. The soft palate healed well and the patient was supplied with an obturator for the fistula she had in the anterior part of the palate.

Discussion

In our experiences, the major complication following pharyngeal flap surgery is post-operative bleeding. In the event of unconsciousness, this bleeding can seriously imperil the functioning of the airways. A clot may cover the laryngeal entry, causing varying degrees of breathing insufficiency, or blood will be swallowed with the saliva and after some time will be regurgitated and aspirated with the accompaniment of hypovolemic shock. The complication of bleeding in our material is approximately as common as in another comparable series (13). Of the 14 instances of post-operative bleeding that caused serious concern regarding the passage of air and the breathing, four (4% of the whole series) necessitated tracheotomy, while the other 10 could easily be corrected with general conservative methods and, in one or two cases, blood transfusion. In the four cases undergoing tracheotomy, one of which died, the intervention was indicated because of bleeding causing obstruction of the upper airway. In one of these cases, the operation was a combination of VY palate retropositioning palatoplasty and pharyngoplasty. In all, these operations constituted 14 out of 89 cases (16%).

If tracheotomy is performed as a prophylactic measure in order to avert the complications of bleeding and airway obstruction, the advantages and disadvantages of this intervention must be evaluated. Tracheotomy should probably be resorted to only in the more compli-

cated cases where it is really needed. According to our experience, tracheotomy will be indicated in cases where there is bleeding in the post-operative period, when this cannot be checked and when there is airway obstruction.

Except for the cases with coagulation anomalies, the value of the surgical and anesthesiological methods should be evaluated.

Nowadays, the surgical technique usually involves the elevation from the posterior pharyngeal wall of a flap as wide as the wall. The flap is often long, up to 7 cm, and is dissected from the prevertebral fascia. This procedure is in contrast with the original description of the method. When the incision is done in the mucous membrane and through the muscles down to the fascia, the edges retract, the defect widens, and the bleeding from the muscle will often be hard to localize. We have often used local anesthesia (Xylocaine® Astra or Citanest® Astra) with adrenaline or noradrenaline (1:100,000 and 1:200,000) in order to achieve a vasoconstriction and minimize the bleeding. In spite of this, there are sometimes a few spots of bleeding that are hard to localize, though with pressure this bleeding can often be stopped. In this connection, it is necessary to discuss whether the use of catecholamines as vasoconstrictors is indicated and whether this may be dangerous. It is known that with the use of catecholamines the general metabolism is accelerated. Klingenström and Westermark (5, 6) have shown cyanosis, decreased oxygen tension, and acidosis following subcutaneous injection of catecholamines. It is also known that with the use of catecholamines locally there is a risk of post-operative bleeding (4) and we have also experienced this. The use of a vasoconstrictor in this operation seems highly desirable, as it will facilitate the dissection of the flap, but according to our experience injection of catecholamines is not advisable.

In our trials with Octapressin® Sandoz, the agent did not seem to affect the local metabolism with the same vasoconstrictor efficiency as adrenaline (4), and, in experimental flaps, larger surviving areas were shown than when Xylocaine with adrenaline was injected. Mention must also be made of general complications, especially of a cardiac nature with the use of adrenaline in combination with general anesthesia produced by ether and fluothane.

To stop bleeding during the operation is, as has been mentioned, not easy, but it seems to be of great importance to try to do so as meticulously as possible. We have usually tied the larger bleeding vessels and lately have also coagulated these by diathermy.

Our experience of a case of hematoma beneath the sutured donor site on the pharyngeal wall, with a consequent danger of airway obstruction, has led us to leave the posterior pharyngeal wall without closure. This has been done by others, such as Skoog (16). No difference between sutured and nonsutured posterior pharyngeal walls has been observed by us in the post-operative course or in the definitive healing.

Usually the operative field is completely or almost completely dry when the operation is finished and the patient is ready to be extubated. It is often in connection with this extubation that bleeding occurs.

From an anesthesiological point of view, it is highly desirable that the patient should wake up quickly after the operation is ended and so be able to control his own airway. It is in this stage of awakening that suction is applied to the trachea and extubation is performed. The upper airways will be irritated by these manipulations and the patient will often cough in connection with his awakening. The described technique of awakening can be accepted, but sometimes it may be necessary to use a technique at extubation and tracheal suction that does not place tension on the sutured pharyngeal flap region and the wound on the posterior pharyngeal wall. In order to avoid this, succinylcholine could be given during extubation and suction, as when intubating, something that can also be done during hernia operations.

Coughing and straining can cause blood congestion in the head and neck, and there will follow bleeding from the wound surface on a posterior pharyngeal wall that the surgeon has left quite dry. Certain information concerning the vascular reactions during such endotracheal manipulations as intubation, extubation, and suction of the airways has been derived from measurements of arterial blood pressure, heart rate, and blood flow in the skin and musculature performed in patients with and without succinylcholine relaxation (1). The various manipulations in the trachea caused marked tachycardia and significant increases in arterial blood pressure and vascular resistances. It was concluded that a reflex activation of sympathetic vasoconstrictor activity followed the tracheal manipulations.

It was also well established that the reactions during intubation were not caused by the barbiturate anesthesia and succinylcholine relaxation, as these two measures together reduce the vascular resistance by 30 to 70% as compared with the control values. (1).

It is clear from these investigations that extubation and tracheal suction can involve a marked hemodynamic stress on a fresh wound surface such as occurs in pharyngeal flap surgery. The post-operative complications with bleeding could be avoided if extubation and cleaning of the upper airways were performed under anesthesia or under succinylcholine relaxation. These measures should be effected with the laryngoscope in order to remove all blood clots and to perform the suction in the pharynx in such a way that the wound surface is not damaged.

Close cooperation between the anesthesiologist and the surgeon during the awakening stage is highly desirable and an understanding of the problems involved is essential if complications are to be avoided. As bleeding is a dominating cause of post-operative complications, we have stressed the importance of meticulous care of the wound surface and of stopping bleeding by means of diathermy and tactical extubation.

Summary

Airway complications following pharyngeal flap surgery in a series of 103 cases are reported. There were 14 instances of post-operative complications (14% of the total group) and all were in connection with bleeding, which has also been important in other series. In 11 of the 14 cases the bleeding was checked by conservative measures or blood transfusions and did not cause concern, while in four tracheotomy had to be performed (with one death). We believe that the hemodynamic stress at extubation and laryngeal suction is due to reflex activation of sympathetic vasoconstrictor activity and venous blood congestion in the head and neck in connection with coughing and straining and are the main causes of post-operative bleeding from a dry, operative field. Extubation should therefore be planned with great care.

reprints: *Bengt Nylén, M.D.*

*Departments of Anesthesiology and Plastic Surgery
Karolinska Hospital
Stockholm 60, Sweden*

References

1. GRAF, K., and WÄHLIN, Å., The effect of endotracheal manipulations in anaesthetized subjects with special reference to the behaviour of the vascular resistance in forearm and hand. *Acta Anaesth. Scand.*, **7**, 169-178, 1963.
2. JOLLEYS, A., and SAVAGE, J. P., Healing defects in cleft palate surgery—the role of infection. *Brit. J. plastic Surg.*, **16**, 134-139, 1963.
3. KINDLER, W., Zur gefährlichkeit der gaumenplastik nach Schönborn-Rosenthal sowie nach Ernst-Halle und zur Möglichkeit, ihr vorzubeugen. *Beitr. Anat. Physiol. Pathol. u Therap. d. Ohres.*, **27**, 187-192, 1929.
4. KLINGENSTRÖM, P., NYLÉN, B., and WESTERMARK, L., Vasoconstrictors and experimental flaps. *Acta chir. Scand.*, **131**, 187-192, 1966.
5. KLINGENSTRÖM, P., and WESTERMARK, L., Local effects of adrenaline and phenylalanyl-lysyl-vasopressin in local anaesthesia. *Acta Anaesth. Scand.*, **7**, 131-137, 1963.
6. KLINGENSTRÖM, P., and WESTERMARK, L., Local tissue oxygen-tension after adrenaline, noradrenaline and Octapressin® in local anaesthesia. *Acta Anaesth. Scand.*, **8**, 261-266, 1964.
7. LONGACRE, J. J., and DEStEFANO, G. A., The role of the posterior pharyngeal flap in rehabilitation of the patient with cleft palate. *Amer. J. Surg.*, **94**, 882-888, 1957.
8. McCLELLAND, R. M. A., and PATTERSON, T. J. S., The influence of penicillin on the complication rate after repair of clefts of the lip and palate. *Brit. J. plastic Surg.*, **16**, 144-145, 1963.
9. McCLELLAND, R. M. A., and PATTERSON, T. J. S., The preoperative anesthetic and postoperative management of cleft lip and palate. *Plastic reconstr. Surg.*, **29**, 642-647, 1962.
10. MUSGRAVE, R. H., and BREMNER, J. C., Complications of cleft palate surgery. *Plastic reconstr. Surg.*, **26**, 180-189, 1960.
11. NYLÉN, B., Cleft palate and speech. A surgical study including observations on velopharyngeal closure during connected speech, using synchronized cineradiography and sound spectrography. *Acta Radiol.*, Suppl. **203**, 1-124, 1961.
12. NYLÉN, B., Synchronized cineradiographic and spectrographic studies of soft palate function and speech results in cleft palate. The value of the velopharyngeal flap. Transactions of the Third International Congress of Plastic Surgery. The Netherlands: Excerpta Medica, pp. 267-273, 1964.
13. OWSLEY, J. Q., and BLACKFIELD, H. M., The technique and complications of pharyngeal flap surgery. *Plastic reconstr. Surg.*, **35**, 531-539, 1965.

14. SCHÖNBORN, Ueber eine neue methode der staphylorrhaphie. *Arch Klin. Chir.*, 19, 527, 1876.
15. SCHÖNBORN, Vorstellung eines falles von staphyloplastik. *Verh. Deutsch. Ges Chir.*, 15, 57-62, 1886.
16. SKOOG, T., The pharyngeal flap operation in cleft palate. A clinical study of eighty-two cases. *Brit. J. plastic Surg.*, 18, 265-282, 1965.
17. WALDEN, R. H., FITZGIBBON, J. H., RUBIN, L. R., GOTTLIEB, E., and BROMBERG, B. E., Advantages of a tracheotomized anesthesia technic in the pharyngeal flap operation. *Amer. J. Surg.*, 94, 889-892, 1957.
18. WALDEN, R. H., RUBIN, L. R., and DIECIDUE, A. A., Technical aid in the pharyngeal flap operation. *Plastic reconstr. Surg.*, 12, 198-202, 1953.