

Morbidity and mortality of post-tonsillectomy bleeding: analysis of cases

D COHEN, M DOR*

Abstract

Objectives: To analyse the circumstances of mortality in post-tonsillectomy bleeding cases, in order to better manage serious problems during resuscitation.

Design: Reports of inquiry committees on post-tonsillectomy mortalities.

Setting: State of Israel Ministry of Health committees.

Participants: Senior otolaryngologists and related professionals, and the involved medical staff who participated in the inquiry committees.

Main outcomes measures: Identification of actions causing undesirable effects on resuscitation outcomes.

Results: In recent years, the post-tonsillectomy mortality rate in Israel has been one in 12 000. The two main causes of death have been severe haemorrhagic shock and airway obstruction.

Conclusions: Active bleeding should be treated, rather than waiting for spontaneous resolution. An efficient airway should be established early during resuscitation, either by intubation (within two minutes) or by cricothyroidotomy. The two main factors endangering the patient's life during resuscitation are severe blood loss, interfering with effective cardiac output, and airway obstruction. Blood loss should be quickly substituted.

Key words: Tonsillectomy; Complications; Mortality; Israel

Introduction

Tonsillectomy is one of the most frequently performed surgical procedures. In many countries, it is performed mainly as an out-patient procedure in order to reduce costs and for the patient's convenience.^{1–3} The rate of post-tonsillectomy bleeding is about 3 per cent.^{4–6} The mortality rate for this procedure is very low.⁷ However, since the procedure is usually performed to improve the quality of life of healthy, mostly young, individuals, any mortality is unacceptable. Bleeding and death are usually sudden and unpredictable.^{8–13}

Death from post-tonsillectomy bleeding is dramatic and sudden, especially in the resuscitation process.^{14,15} Very little has been written in detail about the difficulties faced during such resuscitation.

The cases reported below were each investigated by Israeli Ministry of Health committees. We briefly describe the morbidity and mortality of the seven cases. The information was collected by the medical personnel involved in each case.

The purpose of this report is to stress the possible pitfalls encountered in the management of post-tonsillectomy bleeding and to minimise mortality.

Patients and methods

For medicolegal reasons, any data which might identify patients has been omitted. For each case, the surgical procedure is briefly outlined, followed by the post-operative course, then the bleeding event and its treatment. Personal information such as age or gender (note that all patients are

referred to as 'he') has been withheld. We found the pre-operative course (including blood tests) to be irrelevant in all cases. Although the cases contain important points from the anaesthetist's point of view, we concentrate here on otolaryngology-related points. All surgical procedures were performed by experienced otolaryngologists. Actions that probably affected the outcomes of the treatment are described.

Case one

A healthy young adult patient underwent tonsillectomy for recurrent tonsillitis and peritonsillar abscess. A harmonic scalpel was used. Surgery was uneventful. Bleeding (not excessive) was cauterised. As a precaution, both sides were then sutured with four to five sutures in each side. The sutures passed through the floor of the tonsillar bed.

The post-operative course was uneventful.

A few days later, a sudden, massive haemorrhage occurred. The patient was rushed to the operating room.

The patient was kept in a sitting position, awake, spitting blood, pale and in borderline consciousness. Within 15 minutes, blood loss was estimated as 1000 ml. The blood pressure dropped to 80/50 mm Hg and the pulse rate to 130 bpm, with no femoral pulse. The anaesthetists then anaesthetised the patient intravenously without the use of a mask, and orally intubated him in a semi-sitting position with pressure on the trachea, using a laryngoscope. The first intubation was successful and uneventful. The patient was ventilated manually by the anaesthetists.

From the Department of Otolaryngology/Head and Neck Surgery, Shaare Zedek Medical Centre, and the *General Medical Division, Medical Administration, Israel Ministry of Health, Jerusalem, Israel.

Accepted for publication: 27 December 2006.

The throat and the hypopharynx were full of blood. Suction could not clear the hypopharynx but a good airway was quickly established, verified by end-tidal CO₂ measurements. Initially, the anaesthetists did not encounter airway resistance and did not need to clean the trachea. The tonsillectomy sutures were found to be open but no active bleeding was noticed.

While the surgical field was being inspected, the patient's condition deteriorated. Ten minutes after intubation, while the surgeons were inspecting the throat, hypoxia, hypotension, bradycardia and then cardiac arrest occurred. Oral re-intubation and resuscitation were performed, during which the patient remained anoxic for several minutes. Blood in small quantities was then sucked from the trachea. Blood and fresh plasma were transfused. Medications were given according to the medical protocol procedures. The pulse, arterial oxygen saturation and blood pressure returned to normal values. A bleeding vessel in the tonsillar bed was then identified and sutured. It was estimated that the patient had been anoxic for 10–20 minutes.

The patient did not recover from his coma and died several days later.

The post-mortem findings were of severe brain damage. The cause of the hypoxia was concluded to be severe hypovolaemic shock, together with mild respiratory obstruction shortly after the massive haemorrhage. There were no findings of massive aspiration or severe respiratory obstruction.

Case two

A healthy young patient underwent 'cold steel' tonsillectomy for recurrent tonsillitis. The operation and post-operative course were uneventful.

A few days after surgery, the patient ate solid food, after which massive bleeding and vomiting commenced. The bleeding stopped spontaneously after 30 minutes, but a second haemorrhage commenced an hour later. The patient was then rushed to the operating room.

At that time, the patient was pale and sweating, with a pulse rate of 140 bpm, a blood pressure of 110/60 mm Hg and a haemoglobin concentration of 9.2 g per cent. The estimated blood loss over two hours was 1000 ml. Intubation was attempted a few minutes after the second haemorrhage commenced, while the patient was actively bleeding and vomiting. He was placed in a recumbent position, breathing spontaneously. The anaesthetists administered intravenous muscular relaxants and used a mask to oxygenate the patient under pressure. The anaesthetists then attempted an oral intubation, but could not see the larynx because the mouth and the hypopharynx were full of fresh and clotted blood. The clots were so thick that suction could not clean the area. The patient was anaesthetised intravenously and blind intubation performed. The anaesthetists felt that the tube was in place but could not ventilate the patient. The tube was removed and a second blind intubation attempted, but no ventilation could be achieved this time either. By this stage, the patient had been anoxic for 10 minutes.

The anaesthetists asked the otolaryngologist to perform a tracheotomy. A quick cricothyroidotomy was performed, through which a number five small cannula was inserted, but no airway was obtained. A flexible suction catheter was inserted through the cannula deep beyond the cannula's length, without difficulty, but nothing could be aspirated. After several suction attempts, the surgeon was not sure that the cannula was in place. Suspecting a false route, even though the suction catheter had been easily inserted, the surgeon removed and reinserted the cannula without difficulty, but again could

not establish an airway. By this time, the patient was deeply anoxic, and became bradycardic, followed by cardiac arrest. Resuscitation was continually attempted, but with no response. In the meantime, the anaesthetist cleaned the hypopharynx and oral intubation was again performed, this time under direct vision. There were no signs of ventilation. An extremely high respiratory resistance was found. Suction through the endotracheal tube removed no secretions. The surgeon then extended the cervical incision and performed a tracheotomy. The endotracheal tube was detected inside the trachea, obstructing insertion of the cannula. The endotracheal tube was removed in order to insert the cannula. Blood clots were seen obstructing the endotracheal tube from within. Suction was continued through the cannula and, finally, an end-tidal CO₂ was received. An airway was then achieved and the patient responded to the resuscitation. The patient was estimated to have been anoxic for at least 30 minutes. A tension pneumothorax was then identified, with air trapped under high pressure, and was drained. At this stage, surgery was completed, with the bleeding vessel having been identified and sutured.

The patient was transferred to the intensive care unit, where he died a few days later due to severe brain damage and other related complications.

In the post-mortem examination, traces of blood were found in the bronchi and intestines. The cricothyroidotomy was found to have been correctly performed. No signs of false airway route were found.

Case three

A healthy adult suffering from obstructive sleep apnoea underwent a tonsillectomy with palatoplasty procedure using cold steel instruments. The procedure was uneventful but the patient intermittently bled in the hours after the procedure. The attending staff decided to wait for spontaneous resolution of the bleeding. However, the bleeding increased, and the patient was returned to the operating room.

In the operating room, massive bleeding commenced. The patient was initially in a sitting position, breathing spontaneously. The anaesthesia procedure was begun by placing the patient on his back, recumbent, and giving him an oxygen mask while he was still awake. At that time, the bleeding stopped but the mouth was full of clots. Intravenous muscular relaxants were given and oxygenation of the patient was attempted, using positive pressure through the mask. An oral intubation using a laryngoscope was attempted. The anaesthetist could not see the larynx because the mouth was completely full of blood clots and nothing could be identified. Suction could not clear the mouth. Two blind intubations were attempted but failed to find an airway. In the meantime, forced mask respiration was attempted, but without chest movements. The patient became anoxic, bradycardic and hypotensive, and did not improve after forced mask respiration. Resuscitation was performed. At the same time, the otolaryngologist performed a cricothyroidotomy which was difficult and took several minutes.

An airway was achieved through the cricothyroidotomy, after 15–30 minutes of anoxia, and the oral cavity was inspected. A very large, well organised clot was found obstructing the hypopharynx. Only then could this clot be identified and cleared. A bleeding vessel was identified in the surgical field and was tied. Almost no blood was found inside the tracheobronchial tree. The estimated blood loss was 1000 ml. It was concluded that the blood clot had slowly formed by continuous, minor bleeding in the recovery room, prior to the massive bleeding.

The patient was left with severe brain damage.

Case four

A healthy young child underwent cold steel tonsillectomy. No difficulties or excessive bleeding occurred during the surgery or immediately afterwards. However, a few hours after surgery, the patient had some blood-stained saliva. He was discharged home.

Two days after surgery, at home, the child suddenly started to bleed massively, with respiratory distress and vomiting. The family was helpless to assist. Ten minutes later, the child died. The medical personnel who tried to resuscitate him found the throat full of clotted blood. Resuscitation using a mask was unsuccessful.

A post-mortem examination found blood in the tracheo-bronchial tree and the stomach.

Case five

A healthy young child underwent cold steel tonsillectomy. The surgery and follow up were uneventful.

A week after the surgery, the child ate solid food and started bleeding severely. He was rushed to a medical facility; during the transportation, he was held in a recumbent position.

On arrival, the child was breathless and hypoxic. The mouth was full of blood clots. Artificial forced respiration with a mask and resuscitation were not successful, and the child died.

Cases six and seven

These cases are briefly described due to lack of information concerning the death.

Two healthy young children from separate families underwent cold steel tonsillectomy by different surgeons at different times. The surgical procedures were uneventful.

Sudden bleeding commenced a day after the surgery, and each patient was taken to hospital.

Both patients were dead on arrival, their mouths obstructed by blood clots. Resuscitation was attempted but failed. In each case, the estimated transportation time was about an hour.

Results

The approximate number of tonsillectomies (with or without adenoidectomy) in Israel is estimated by the Israeli Ministry of Health as 12 000 per year (compared with an Israeli population of 7.5 million). The number of fatalities over the last six years has been about one per year, i.e. one in 12 000 operations (seven fatalities from 85 000 surgical procedures). Various surgical techniques are used, the commonest using cold steel instrumentation. Most of the procedures are performed on children, within ambulatory day care surgical facilities. The children are released home after six hours or more, while adults are kept for 24 hours.

Discussion

The aim of this report is to describe the difficulties that can be encountered during emergency management of sudden post-tonsillectomy bleeding. Early discharge of patients following surgery is supported by the rarity of deaths following tonsillectomy, by patients' desire to leave the surgical unit, and by other statistical findings.^{2,3} When severe bleeding occurs at home, patients frequently cannot get appropriate medical help in time. The events described above happened in several hospitals. Although the conclusions, when analysed, seem obvious, the rarity and severity of these events frequently finds the clinical team

unprepared. Therefore, we make the following recommendations and comments based on these cases.

Surgical technique

There is no consensus on the safety of the various cold steel instrumental techniques, compared with new, more sophisticated techniques.^{16,17}

Short or long admission after surgery?

Predicting bleeding is impossible. A short stay has been recommended for children,^{2,3,6,18} and a longer stay for patients younger than three years,^{1,19–21} for adults and for cases with bleeding.^{9,13,17}

Post-operative instructions

The post-operative instructions given to the patient, concerning diet and physical activity, vary greatly between surgeons.²¹ We feel that erring on the side of caution may lower the complications rate (see cases two and five).

Minor bleeding

In cases of minor, active bleeding, it is always preferable to examine the surgical area in the operating room, or to have one on standby, in case of sudden, massive bleeding. Treatment of active bleeding is preferable rather than waiting for spontaneous resolution, since sudden, massive bleeding may follow (see cases two, three and four).

Severe bleeding

In cases of severe bleeding, two main difficulties arise: airway maintenance and hypovolaemic shock. It should be stressed that it is not only the airway obstruction that endangers the patient but also the hypovolaemic shock. Hypovolaemic shock occurred in all the above cases but was especially demonstrated in cases one, two and four. In all the cases, severe obstruction of the hypopharynx by blood and clots interfered with intubation and respiration. In severe cases such as those described above, the hypovolaemic shock was so marked that it could not have been or was not substituted with blood within the critical time period (see cases one and three).

Emergency management

The clinical team treating post-tonsillectomy bleeding should work simultaneously in order to save time. All the medical personnel interviewed in the above cases underestimated the time duration of the procedures. The anaesthetist should organise the team and should decide on airway management and the timing of cricothyroidotomy (an early decision is recommended). It is recommended to limit intubation trials to a maximum of two, or to within two minutes, in order to allow enough time for cricothyroidotomy and to avoid severe hypoxia (see cases one, two and three).

Patient positioning

The patient should be kept in a sitting position or on their side, with spontaneous respiration. No muscular relaxants should be given (see cases one, two and three).

Medication

Vasopressors should be withheld when severe hypotension occurs, unless given intravenously (see cases one, two and three).

Airway and intubation

Blood clots should be immediately cleared from the hypopharynx using a finger, sponge or suction, and awake-intubation should be preferred. In case of hypoxia, intubation attempts should cease and the airway should be established by cricothyroidotomy. The use of forced, high-pressure respiration (through mask or endotracheal tube) should be avoided in order to prevent blood being pushed into the tracheobronchial tree and to prevent pneumothorax (see cases one and three).

Blood transfusion

Blood transfusions should be rushed in high volumes to overcome hypovolaemic shock (see cases one, two and three).

- **This paper analyses in detail cases of post-tonsillectomy complications with a fatal outcome. The study originates from Israel, where in recent years the post-tonsillectomy mortality rate has been one in 12 000**
- **The two main causes of death were severe haemorrhagic shock and airway obstruction**
- **Active bleeding should be treated rather than waiting for spontaneous resolution**
- **An efficient airway should be established early during resuscitation, either by intubation (within two minutes) or by cricothyroidotomy**

Suturing the tonsillar bed

We hold that suturing the tonsillar bed during regular tonsillectomy should avoid deep suturing of the floor. In case one, we suspected a tear of a blood vessel due to strangulation by a suture and necrosis. However, this recommendation cannot be supported and is based only on our clinical impression.

Distance of patient from hospital

This may be a critical factor in cases of sudden bleeding. Surgeons should consider recommending that patients stay near the hospital, always with a responsible adult, during the first seven to 10 days after tonsillectomy (see cases four to seven).

Blood-stained saliva

Bloody saliva is an indication of bleeding potential. It should be considered as a contraindication for a patient's early discharge (see cases two and five).

Instructions on sudden bleeding

Patients should be instructed on how they should manage sudden bleeding at home and in what position should they keep the patient (i.e. avoiding the recumbent position) until they reach the hospital (see cases four to seven).

Conclusion

In conclusion, sudden post-tonsillectomy bleeding may be fatal. Clear instructions for the patients may be helpful in diminishing its occurrence. The medical team should

work efficiently in rapidly establishing an airway and replacing blood loss. A cricothyroidotomy should be considered early in the resuscitation, whenever endotracheal intubation is difficult.

Acknowledgements

We wish to thank the following members of the investigation committees for their valuable and in-depth clinical analysis of the complications of the cases presented: Avishag Kadari MD, Head of Pediatric Anaesthesiology, Hadassah Medical Centre, Jerusalem; Sylvianne Bursztein De-Myttenaere MD, Director of the Intensive Care Unit, Carmel Medical Centre, Haifa; Rafael Feinmesser MD, Head of Otolaryngology/Head and Neck Surgery Departments, Rabin Medical Centre, Petah Tiqva; Jean-Yves Sichel MD, Senior Otolaryngologist at the Hadassah Medical Centre, Jerusalem; and Shai Katz MD, Head, Department of Anaesthesiology, Emek Medical Centre, Afula, Israel.

References

- 1 Peeters A, Van Rompay D, Schmelzer B, Vidts G, Katz S. Tonsillectomy and adenotomy as a one day procedure? *Acta Otorhinolaryngol Belg* 1999;**53**:91–7
- 2 Lalakea ML, Marquez-Biggs I, Messner AH. Safety of short-stay tonsillectomy. *Arch Otolaryngol Head Neck Surg* 1999;**125**:749–52
- 3 Chiang TM, Sukis AE, Ross DE. Tonsillectomy performed on an outpatient basis. *Arch Otolaryngol* 1968;**88**:105–10
- 4 Handler SD, Miller L, Richmond KH, Baranak CC. Post-tonsillectomy haemorrhage: incidence and management. *Laryngoscope* 1986;**96**:1243–7
- 5 Windfuhr JP, Sesterhenn K. Haemorrhage after tonsillectomy. Analysis of 229 cases [in German]. *HNO* 2001;**49**:706–12
- 6 Ross AT, Kazahaya K, Tom LWC. Revisiting outpatient tonsillectomy in young children. *Otolaryngol Head Neck Surg* 2003;**128**:326–31
- 7 Carmody D, Vamadevan T, Cooper SM. Post tonsillectomy haemorrhage. *J Laryngol Otol* 1982;**96**:635–8
- 8 Windfuhr JP. Lethal post-tonsillectomy haemorrhage. *Auris Nasus Larynx* 2003;**30**:391–6
- 9 Chowdhury K, Tewfik TL, Schloss MD. Post-tonsillectomy and adenoidectomy haemorrhage. *J Otolaryngol* 1988;**17**:46–9
- 10 Irani DB, Berkowitz RG. Management of secondary haemorrhage following pediatric adenotonsillectomy. *Int J Pediatr Otolaryngol* 1997;**40**:115–24
- 11 Windfuhr JP. Excessive post-tonsillectomy haemorrhage requiring ligation of the external carotid artery. *Auris Nasus Larynx* 2002;**29**:317–18
- 12 Windfuhr JP, Chen YS. Incidence of post-tonsillectomy haemorrhage in children and adults: study of 4,848 patients. *Ear Nose Throat J* 2002;**81**:626–8
- 13 Khan EAS, Young D, Adamson R. Assessment of secondary haemorrhage rates following adult tonsillectomy – a telephone survey and literature review. *Clin Otolaryngol* 2003;**28**:489–91
- 14 Capper JWR, Randall C. Post-operative haemorrhage in tonsillectomy and adenoidectomy in children. *J Laryngol Otol* 1984;**98**:363–5
- 15 Peeters A, Claes J, Saldien V. Lethal complications after tonsillectomy. *Acta Otorhinolaryngol Belg* 2001;**55**:207–13
- 16 Vaiman M, Eviatar E, Shlamkovitz N, Segal S. Effect of modern fibrin glue on bleeding after tonsillectomy and adenoidectomy. *Ann Otol Rhinol Laryngol* 2003;**112**:410–14
- 17 Linden BE, Gross CW, Long TE, Lazar RH. Morbidity in pediatric tonsillectomy. *Laryngoscope* 1990;**100**:120–4
- 18 Bennet AMD, Clark AB, Bath AP, Montgomery PQ. Meta-analysis of the timing of haemorrhage after

- tonsillectomy: an important factor in determining the safety of performing tonsillectomy as a day case procedure. *Clin Otolaryngol* 2005;**30**:418–23
- 19 Windfuhr JP, Chen YS. Post-tonsillectomy and -adenoidectomy haemorrhage in nonselected patients. *Ann Otol Rhinol Laryngol* 2003;**112**:63–70
- 20 Postma DS, Folsom F. The case for an outpatient “approach” for all pediatric tonsillectomies and/or adenoidectomies: a 4-year review of 1419 cases at a community hospital. *Otolaryngol Head Neck Surg* 2002;**127**:101–8
- 21 Kay DJ, Mehta V, Goldsmith AJ. Perioperative adenotonsillectomy management in children: current practices. *Laryngoscope* 2003;**113**:592–7

Address for correspondence:
Dr David Cohen,
Department of Otolaryngology/Head and Neck Surgery,
Shaare Zedek Medical Centre,
Jerusalem, Israel.

Fax: +972 2 651 0808
E-mail: cohendv@netvision.net.il

Dr D Cohen takes responsibility for the integrity of the content of the paper.
Competing interests: None declared
