

Review Article

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Cite this article: Williamson A, Coleman H, Douglas C. Does infection play a role in post-tonsillectomy haemorrhage? A narrative review. *J Laryngol Otol* 2023;**137**:710–717. <https://doi.org/10.1017/S0022215122002547>

Accepted: 7 November 2022
First published online: 13 December 2022



Key words:

Tonsillectomy; Tonsillitis;
Peritonsillar Abscess;
Postoperative Complication;
Postoperative Haemorrhage;
Surgical Wound Infection

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Does infection play a role in post-tonsillectomy haemorrhage? A narrative review

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Abstract

Objective. Post-tonsillectomy haemorrhage is an increasingly common cause of morbidity following tonsillectomy. Secondary post-tonsillectomy haemorrhage occurring more than 24 hours after an operation has long been attributed to post-operative infection; however, there is little evidence to support this hypothesis and the associated use of antibiotics in the current literature.

Method. This study looked at the aetiology and evidence-based management of post-tonsillectomy haemorrhage, and investigated the impact of bacterial infection and antimicrobials on the pathogenesis and clinical course of this complication.

Results. A number of peri-operative risk factors for post-tonsillectomy haemorrhage exist, and infective pathologies, including recurrent or chronic tonsillitis and group A streptococcus on blood cultures, may predispose to bleeding. Very few studies have shown a link between post-tonsillectomy haemorrhage and objective markers of infection such as pyrexia, raised inflammatory markers or positive microbiology cultures. The role of antibiotics in secondary post-tonsillectomy haemorrhage remains controversial, and numerous randomised, controlled trials of peri-operative antibiotics have shown no significant difference in bleeding rates between antibiotics and controls.

Conclusion. Further trials investigating the role of antibiotics and more robust studies investigating the presence of bacterial infection at the time of bleeding may be required to determine the true role of infection in post-tonsillectomy haemorrhage.

Introduction

Tonsillectomy remains one of the most common operations performed by otolaryngologists worldwide. In the UK, national recommendations by the Scottish Intercollegiate Guidelines Network (SIGN) state that a patient must have suffered seven episodes of tonsillitis in one year or must have experienced a complication of tonsillitis, such as recurrent peritonsillar abscess, to be eligible for tonsillectomy.¹

Because of the morbidity associated with tonsillitis and deep neck space infections, tonsillectomy may have a significant effect on a patient's quality of life. In our own institution in Glasgow, a study of 123 patients found there was a significant improvement in patients' disease-specific quality of life following tonsillectomy.² Numerous other studies using similar design protocols have echoed these results, finding improvements in both tonsillitis specific and global quality of life.^{3–5} However, a 2014 Cochrane review concluded that there is currently insufficient level 1 evidence to support use of tonsillectomy over medical measures.⁶ To this end, The National Trial of Tonsillectomy in Adults study, a national prospective, randomised, controlled trial comparing tonsillectomy to medical therapy, may provide more definitive evidence on the efficacy of tonsillectomy over conservative measures; however, the results are yet to be published.⁷

Despite the potential benefit to quality of life, tonsillectomy is a procedure that carries significant post-operative morbidity, in particular from pain and post-tonsillectomy haemorrhage. Post-tonsillectomy haemorrhage has been classically described as primary or secondary bleeding. Primary haemorrhage is rarer, typically occurring within the first 24 hours of surgery, and has been attributed to inadequate haemostasis or slipping of ligatures at the end of the procedure.⁸ Secondary haemorrhage most often occurs between post-operative days 5 to 10 but may occur at any time up to 2 weeks following surgery. Perceived clinical wisdom is that secondary haemorrhage is an infective process, with patients commonly managed with oral and intravenous antibiotics on a routine or emergent basis. There remains very little evidence to support this theory however, with relatively few studies demonstrating objective evidence of infection in patients with post-tonsillectomy haemorrhage and few trials supporting the routine use of post-tonsillectomy antibiotics.⁹

In this narrative review, we aim to discuss the aetiological factors and evidence-based management of post-tonsillectomy haemorrhage. In particular, we will explore the evidence supporting the role of bacterial infection in haemorrhage and the efficacy of antimicrobials in preventing and managing bleeding after tonsillectomy.

Search strategy

Articles for this review were identified using searches of Medline, Embase, Google® Scholar and the NHS Lanarkshire library catalogue with the search terms ‘post-tonsillectomy bleeding’, ‘post-tonsillectomy haemorrhage’ and ‘infection’ using Boolean operators. All full-text articles in the English language from inception to November 2021 were considered. Studies containing both adult and paediatric patients were included. The references of relevant articles and systematic reviews were also scanned for other relevant texts. We did not consider case reports, conference abstracts, letters to the editor, responses, or unpublished data for the purposes of this narrative review.

Microbiology of tonsillitis

There have been several studies performed with the aim of investigating the microbiome of tonsils, particularly in those removed for recurrent infection. The bulk of research to date on the microbiome of the upper airways is from culture-based studies. A drawback of this approach is that the majority of sampling methods employed analyse a fraction of bacteria present on mucosal surfaces that can be grown easily within the laboratory environment. Recent advances, such as the use of 16s ribosomal RNA sequencing, have allowed broader identification of species both upon the mucosal surface and within tonsillar tissue.¹⁰

In terms of implicated organisms, paediatric studies of patients undergoing adenotonsillectomy for adenotonsillitis have emphasised the polymicrobial nature of this infection. Commonly isolated organisms include aerobes, alpha-haemolytic streptococci, non-pathogenic neisseria species and corynebacterium species in addition to pathogenic species, including haemophilus species, *Staphylococcus aureus*, beta-haemolytic streptococci and *Streptococcus pneumoniae*.¹¹ Anaerobic bacteria were also isolated including peptostreptococcus, prevotella and fusobacterium species.¹²

A large retrospective case study of tonsillar core tissue from 824 children and adults demonstrated predominance of *S aureus*, haemophilus species and beta-haemolytic streptococcus. *Streptococcus pneumoniae* was isolated more commonly in younger patients, whereas *Klebsiella pneumoniae* was isolated more often in adults.¹³ In peritonsillar abscess, the significant pathogens in most cases remain unclear because of the polymicrobial mixture of aerobes and anaerobes recovered from pus aspirates. However, studies to date have suggested a pathogenic importance of *Fusobacterium necrophorum* and group A streptococci, both of which have the highest isolation rates from peritonsillar abscess aspirates.¹⁴

The failure of antimicrobial therapy in patients with recurrent tonsillitis is most likely multi-faceted. It has now been established that tonsillitis and associated lymphoid hyperplasia is caused by the presence of multiple pathogenic species throughout the tissue, rather than the long-held perspective that chronic tonsillitis is the result of colonisation of a particularly stubborn solitary organism. In addition, the persistence of infection with multiple pathogenic organisms lends itself to biofilm formation in up to 60 per cent of patients.¹⁵

Biofilms are composed of bacterial cells embedded within a complex glycoprotein matrix and have long been implicated in chronic infection of many anatomical subsites, including bone, the respiratory system and middle ear. Biofilms are thought to make bacteria up to 1000 times more resistant to antimicrobial

therapy, which may be represented by the discrepancies observed between *in vitro* and *in vivo* antimicrobial susceptibility and why after seemingly appropriate treatment, tonsillitis recurs.¹⁶ In these individuals, tonsillectomy or the use of antimicrobials with established biofilm potency may be their only option of successful treatment.

Wound healing after tonsillectomy

The physiological processes that underpin wound healing following tonsillectomy are poorly understood, and studies have been largely limited to animal models and subjective clinical and photographic assessment in humans. The healing processes following tonsillectomy have been described as early, intermediate and late.¹⁷ The early stage occurs within the first 24–48 hours and is characterised by oedema, pain from exposed muscle and nerve fibres, and activation of a local acute inflammatory response. From approximately day 5 to day 14, the intermediate stage is synonymous with formation of a white material within the tonsil fossa, known as a fibrinous clot, which is thought to contain inflammatory cells and bacteria. Simultaneously, the fossa begins to epithelialise from the raw edges of mucosa, and there is a proliferation of granulation tissue and blood vessels.^{18,19} During this stage, contracture of the oropharyngeal mucosa and growth of underlying granulation tissue can cause sloughing of the fibrinous clot and exposure of naive blood vessels, which may be an alternative pathogenic mechanism in secondary haemorrhage. In the final late stage, fossae epithelialisation is complete and the vascular stroma recedes, along with the associated risk of haemorrhage.^{17,18}

How the existing oropharyngeal flora influence these healing processes is not understood, and no studies appear to have investigated the presence of local bacterial infection in acute post-tonsillectomy haemorrhage patients. In a recent systematic review of five studies comparing pre- and post-operative oropharyngeal swab cultures, there was found to be a statistically significant reduction in group A beta haemolytic streptococcus, *Haemophilus influenzae* and *S pneumoniae*, with an associated increase in normal commensal oral and respiratory bacteria.²⁰ Unfortunately, of the included studies, none reported the rate of post-operative bleeding, and it is thus uncertain if either this change in the tonsil fossa biome or an acute post-operative infection are involved in the pathogenesis of post-tonsillectomy haemorrhage.

Epidemiology

Acute tonsillitis remains an extremely common condition, with the resultant patient morbidity creating a huge burden on primary care. A 2004 study of the UK general practice database estimated an annual incidence of acute tonsillitis of 37 per 1000 of the population per year.²¹ This volume of morbidity may have an enormous knock-on effect on the economy, with ENT UK estimating tonsillitis accounts for 35 million lost school and work days per year, costing an estimated £60 million in primary care consultations annually.²²

Tonsillectomy therefore remains one of the most frequently performed operations in the UK, with over 40 000 procedures being performed in England between 2019 and 2020.²³ In Scotland, between 2000 and 2018, over 2600 paediatric tonsillectomy procedures were performed each year, although during this time period the proportion of procedures

undertaken for sleep-disordered breathing increased compared with those for recurrent tonsillitis.¹¹

In 2003, the national tonsillectomy audit of England and Wales found that in 40 514 patients there was an overall 3.5 per cent post-operative bleeding rate (0.6 per cent primary, 3 per cent secondary), with 0.9 per cent requiring a return to the operating theatre. Of note, higher rates of bleeding were documented in 'hot' tonsillectomy techniques such as bipolar diathermy.²⁵ This audit has been frequently criticised for underestimating the national rate of bleeding, with many other studies noting a considerably higher primary and secondary bleeding rate.

In Scotland, it has recently been documented that the national bleeding rate appears to be on the rise and is in fact significantly higher than previously reported.²⁶ Between two adult and paediatric cohorts in 1998–2002 and 2013–17, there was a substantial rise in 30-day re-admission with bleeding (6.9 per cent to 12.1 per cent) and return to the operating theatre for arrest of haemorrhage (2.3 to 3.1 per cent). Of note, re-admission rates with bleeding in adult patients were considerably higher, ranging from 9.8 to 19.9 per cent in the 2013–17 cohort.

The cause of this rise is purely speculative, but could be roughly correlated with the reduction in tonsillectomy procedures for tonsillitis following the introduction of the national Scottish Intercollegiate Guidelines Network guidelines and the subsequent rise in the severity of tonsillitis and deep space neck infections noted in England, Scotland and Wales.^{27–29} However, results from the Swedish tonsillectomy database noted a reduction in the post-tonsillectomy haemorrhage rate over 10 years from 2 per cent to 0.96 per cent.³⁰ Stable bleeding rates have also been demonstrated in numerous other countries across the world.^{31–33} This may infer this issue may be unique to the UK, likely caused by a multi-factorial interplay of surgical technique, patient population, national policy, and local oropharyngeal flora.

Risk factors

The surgical, patient and environmental factors that influence the rate of post-tonsillectomy haemorrhage have been extensively studied through retrospective and observational cohort studies (Table 1). It is now well established that surgical technique has a major impact on post-operative morbidity, with the UK national tonsillectomy audit establishing a significantly increased risk of secondary bleeding in bipolar (4.3 per cent) and monopolar (5.5 per cent) electrocautery techniques compared with cold steel dissection with ties (1 per cent).²⁵ These results have been echoed by studies derived from the National Tonsil Surgery Register of Sweden, which have highlighted increased post-operative pain and haemorrhage demanding re-admission and return to the operating theatre with bipolar dissection.^{34,35} This trend also extends to other 'hot' electro-surgical techniques, including Coblation®, radiofrequency ablation and ultracision, all of which exhibit worse post-operative bleeding compared with 'cold' dissection.^{34,36,37} In addition, increasing seniority and experience of the operating surgeon may influence the rate of bleeding regardless of haemostatic technique employed.³⁸

When considering patient characteristics, many studies commonly report a significantly higher rate of bleeding in older, male patients.^{35,38–47} This finding is also noted within paediatric cohorts, with males aged greater than 15 years old being at a significantly higher risk than younger children.^{48,49}

Severity of post-operative pain, aspirin use, elevated post-operative blood pressure, high intra-operative blood loss, and cigarette smoking have also been associated with worse bleeding outcomes.^{41,45,47,50} The indication for surgery appears to have a more variable effect, with studies finding conflicting rates of bleeding between paediatric patients with sleep-disordered breathing and tonsillitis.^{51–53}

Inherited coagulopathies appear to have only a minor influence on post-tonsillectomy haemorrhage, with patients diagnosed with von Willebrand disease having similar bleeding rates to non-coagulopathic patients.^{54,55} Moreover, the incidence of undiagnosed coagulopathies in bleeding patients on routine coagulation screening bloodwork seldom influences post-operative bleeding rates or surgical management.^{56,57}

Seasonal, meteorological, and temporal variations may also have an influence, with winter months, cyclonic weather and the hours between midnight and 6 am being associated with a higher rate of bleeding.^{58–60} Finally, a 2009 study confirmed there was no relationship between post-tonsillectomy haemorrhage and red hair, Friday the 13th, or the full moon, and bleeding did not occur commonly in clusters of three patients, perhaps debunking some beliefs of the superstitious otolaryngologist.⁶¹

Risk factors: bacterial infection

Tonsillectomies for acute and chronic tonsillitis are often perceived by many otolaryngologists as more challenging and susceptible to bleeding compared with other indications. The pathophysiological reasons for this have not been described, although factors such as a more fibrotic, scarred tonsil capsule, subclinical inflammation, chronic ischaemia, neovascularisation, and endothelial damage may result in a distortion of dissection planes,¹⁷ worsening intra-operative bleeding, and putting greater reliance on electrocautery techniques.

Multiple studies appear to support this hypothesis, with findings that patients with chronic tonsillitis are considerably more likely to suffer post-tonsillectomy haemorrhage compared with those undergoing tonsillectomy for other indications.^{25,40,47,48} Unfortunately, these studies did not adjust for the previously discussed patient and surgical variables that may contribute to bleeding risk. Two larger studies have found that post-tonsillectomy haemorrhage was more frequently seen in chronic tonsillitis patients on univariate analysis; however, the statistical significance disappeared on multivariate logistic regression.^{35,51} This perhaps deduces that previous infection may have some role in the pathogenesis of post-tonsillectomy haemorrhage but is a less significant confounding factor than variables such as age, gender, and surgical technique.

Abscesses secondary to tonsillitis are a growing problem, and research performed by colleagues in our institution found that in Scotland between 1993 and 2016 the rates of peritonsillar abscess and deep space neck infections rose by 137 per cent and 500 per cent, respectively.²⁷ Similar findings have been identified elsewhere in the UK and Europe, with retrospective studies in England, Wales and Germany also noting rises in tonsillitis admissions and deep neck space abscesses.^{28,29,62} The higher incidence of deep neck space abscesses has coincided with the aforementioned upsurge in secondary post-tonsillectomy haemorrhage in Scotland over a similar time period.²⁶ It could thus be ventured that tonsillar abscesses may create a more hostile surgical field that is more prone to bleeding.

Table 1. Summary of common infective, surgical, demographic and environmental risk factors for post-tonsillectomy haemorrhage

Infection	Surgical	Patient	Environmental
History of chronic & recurrent tonsillitis ^{35,51}	'Hot' tonsillectomy techniques (monopolar, bipolar, Coblation, ultracision) ^{25,34-37}	Male gender ^{35,38-47}	Winter months ⁵⁸
Previous blood cultures positive for group A streptococcus ⁴³	Surgeon inexperience ³⁸	Increased adult age ^{35,38-47}	Time of day (00:00-06:00) ⁵⁹
	Increased post-operative pain ⁵⁰	Current cigarette smoking ⁴⁵	Cyclonic weather ⁶⁰
	High intra-operative blood loss ⁴⁷	Aspirin use ⁴¹	
	Elevated post-operative blood pressure ⁴⁷	Older children / teenagers ^{48,49}	

The existing literature does not entirely support this proposition. A recent retrospective series found no significant difference in post-tonsillectomy haemorrhage between peritonsillar abscess (9.73 per cent) and chronic tonsillitis patients (10.22 per cent).⁶³ Perhaps even more unexpectedly, a series by Giger *et al.* of peritonsillar abscess tonsillectomy found a significantly higher rate of bleeding in the tonsil contralateral to the abscess (4 per cent vs 9 per cent).⁴¹ A later Danish study did not replicate these results however, simply finding equivalent rates of bleeding between ipsilateral and contralateral tonsil fossae.⁴³ Interestingly, this study also found that a prior history of blood cultures positive for group A streptococcus increased the likelihood of post-tonsillectomy haemorrhage, hinting that more severe preceding systemic infection, rather than local infection, can increase the likelihood of post-operative complications following tonsillectomy.

Objective markers of infection

Secondary post-tonsillectomy haemorrhage has long been described as an infectious process regardless of the presence of infective signs, symptoms, and clinical markers. Unfortunately, there are relatively few studies that have sought to verify this theory by investigating for the presence of objective indicators of infection such as raised inflammatory markers, fever, and positive microbiology cultures.

One such study observed infective parameters, including pyrexia (defined as more than 37.5°C) and biochemical markers such as raised white cell, neutrophil, and C-reactive protein (CRP) counts, in 47 patients with secondary post-tonsillectomy haemorrhage.⁶⁴ The authors noted a raised white cell count in 31 per cent and raised CRP level in 55 per cent; however, these seldom correlated with each other or with the presence of pyrexia. This paper was later criticised for monitoring these variables at only a single time point, having a short duration of follow up, and not including clinical markers of infection such as erythema or halitosis. Nevertheless, subsequent studies have found that CRP levels frequently remain within normal range in post-tonsillectomy haemorrhage patients, and there is no significant difference in white cell count in those who suffered a post-tonsillectomy complication compared with those who did not.^{65,66}

The phenomenon of a bacteraemia noted on blood cultures taken following tonsillectomy is well recognised, occurring in 20-80 per cent of patients between varying case series.⁶⁷⁻⁷³ Such bacteraemia appears to be less frequent in paediatric patients with sleep-disordered breathing symptoms compared with tonsillitis, although lower rates have also been noted in

peritonsillar abscess and 'hot' tonsillectomy cases.^{74,75} Despite being a common feature of many tonsillar infections, group A β -haemolytic streptococcus is not a universal finding, with *H influenzae* and *Streptococcus viridans* also frequently grown on culture.^{68,76} This finding appears to represent a transient bacteraemia that seldom transitions into a post-tonsillectomy haemorrhage, fulminant streptococcal sepsis, or a bacterial induced endocarditis.^{77,78}

The association between this fleeting bacteraemia and post-operative bleeding has not been studied extensively, with a single case series of secondary haemorrhage previously noting positive blood cultures in only 4 patients (16.7 per cent).⁷⁹ A further larger series of adenotonsillectomy patients found a post-operative bacteraemia in 20.5 per cent of patients, with this cohort noting a greater intra-operative blood loss compared with culture-negative patients.⁸⁰

Only one study has sought to establish a connection between bacterial colonisation of the pre-operative tonsil fossa and post-operative haemorrhage.⁸¹ Of the patients with positive cultures, 63 per cent were positive for group A β -haemolytic streptococcus; however, the authors noted a more diverse range of bacteria than expected, including *H influenzae* and streptococcus from Lancefield groups B, C and G. The study ultimately found that patients with positive cultures had a significantly higher rate of post-tonsillectomy haemorrhage compared with those with negative cultures (8.8 per cent vs 26.9 per cent), implying that operating in the presence of chronic or active infection may put the patient at an unacceptably greater risk of post-operative bleeding.

Management: role of antimicrobials

The initial management of post-tonsillectomy haemorrhage should focus on direct haemorrhage control with topical haemostats and circulatory resuscitation with intravenous fluids or blood products. In more severe cases, where bleeding cannot be controlled with conservative measures, it may be necessary to secure the patient's airway with endotracheal or supraglottic devices and transfer to the operating theatre for definitive surgical haemostasis.⁸²

After primary resuscitation, courses of oral and intravenous antibiotics are commonly employed in the management of secondary post-tonsillectomy haemorrhage across many institutions. For example, our own unit's local guidelines currently recommend use of oral or intravenous broad-spectrum antibiotics such as amoxicillin with clavulanic acid in any patients presenting with acute bleeding after tonsillectomy. The use of antibiotics in post-tonsillectomy haemorrhage is an area of significant controversy in the literature, with most randomised,

controlled trials having investigated the use of intra- and peri-operative antibiotics and their effect on subsequent bleeding.

A previous Cochrane review of 10 studies found significant variation in outcomes, with meta-analysis ultimately finding peri-operative antibiotics did not reduce total secondary bleeding or significant bleeding requiring hospitalisation, transfusion, or return to the operating theatre.^{9,83–92} Similarly, peri-operative antibiotics did not improve secondary outcomes, such as post-operative pain or analgesia use; however, meta-analysis found a reduced rate of post-operative fever in the antibiotic group. It is uncertain if this lower rate of pyrexia represents a true reduction in post-operative tonsil fossa infection or is merely masking the aforementioned transient post-operative bacteraemia often noted on blood cultures following tonsillectomy. An updated 2019 systematic review of 12 randomised trials likewise concurred there was no significant difference in post-operative bleeding between antibiotics and control. In contrast to the Cochrane review, this group found no difference in post-operative fever between groups.⁹³ Of note, pooled analysis in the original Cochrane review did show a higher rate of minor adverse events in the antibiotic group; although this did not achieve statistical significance.⁹

Owing to the mounting body of evidence against the use of post-operative antibiotics, the American Academy of Otolaryngology–Head and Neck Surgery published a 2011 guideline stating that surgeons ‘should not routinely administer or prescribe peri-operative antibiotics to children undergoing tonsillectomy’.⁹⁴ Following publication, there was a mammoth drop in post-operative antibiotic prescription from 97 per cent to 6 per cent of all patients, with no significant change in emergency department visits or re-admissions.⁹⁵ However, there was noted to be a small but statistically significant increase in post-tonsillectomy haemorrhage. It is somewhat difficult to ascertain why these findings appear to contradict previous research, but it could be explained by a change in the severity of bleeding without antibiotics, other confounding risk factors, hypervigilance by parents and clinicians, or spurious statistical results.

Given the current evidence, it has to be concluded that there is no role for the use of routine post-operative antibiotics following tonsillectomy. Moreover, in the absence of overt infective symptoms such as pyrexia, antibiotics may be detrimental to post-operative recovery by the additive morbidity of medication side effects. It is also unclear if the ineffectiveness of antibiotics in post-tonsillectomy haemorrhage confirms or denies the theory that secondary bleeding is a truly infective process or if there are a particular cluster of risk factors or patients who may benefit from routine prescription of antimicrobials.

In addition, it must be noted that all studies discussed investigated the use of routine intra- and peri-operative antimicrobials following tonsillectomy. Resultantly, we have no clear understanding of the effects that oral and intravenous antibiotics have on outcomes when used in patients presenting with an emergency acute post-tonsillectomy haemorrhage.

Management: non-antimicrobial interventions

There has been a plethora of treatment options trialled to curb the degree of post-operative morbidity after tonsillectomy, ranging from local anaesthetic infiltration of the fossa to more unusual approaches, including acupuncture and topical honey.^{96–98} Studies investigating such treatments have largely

evaluated their effect on morbidity from post-operative pain, and their efficacy in preventing post-tonsillectomy haemorrhage is unknown.

One such intervention is dexamethasone, which is widely used as a tool in reducing post-tonsillectomy pain, nausea and vomiting in paediatric practice following the publication of two meta-analyses.^{99,100} The efficacy of dexamethasone is somewhat controversial in the management of post-tonsillectomy haemorrhage. A meta-analysis of 10 trials containing 580 adult patients found a significant reduction in post-operative bleeding compared with controls.¹⁰¹ Conversely, multivariable logistic regression analysis of over 60 000 Japanese patients identified intra-operative dexamethasone as an independent risk factor for post-operative bleeding.¹⁰² Nevertheless, dexamethasone continues to be a mainstay of peri-operative management owing to its efficacy in reducing other post-tonsillectomy morbidity.

A more promising avenue of treatment is tranexamic acid. Tranexamic acid is a synthetic form of the amino acid lysine, which acts upon the coagulation cascade by preventing the conversion of plasminogen to plasmin, thus reducing the breakdown of fibrin, a key component of blood clots. A large randomised, controlled trial; Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage-2, demonstrated that early use of tranexamic acid reduced mortality from bleeding in trauma patients.¹⁰³ Although the mortality rate from post-tonsillectomy haemorrhage is negligible, it could be extrapolated that use of tranexamic acid may influence morbidity from bleeding in tonsillectomy patients.

A 2013 systematic review of the use of oral and intravenous tranexamic acid showed that it significantly reduced mean intra-operative blood loss but had no influence on the rate of post-operative haemorrhage.¹⁰⁴ However, a recently published update of this review comprising 10 randomised, controlled trials was more promising, with pooled meta-analysis of 111 898 patients finding statistically significant reductions in intra-operative blood loss ($p = 0.016$) and the rate of post-tonsillectomy haemorrhage ($p < 0.0001$).¹⁰⁵ Other delivery systems, such as topical and nebulised tranexamic acid may have a role in the initial presentation of post-tonsillectomy haemorrhage, but studies thus far have been limited to a small number of case reports and retrospective series.^{106,107}

Topical hydrogen peroxide has in the past been favoured as an adjunct in acute bleeding and as a peri-operative antimicrobial to reduce the risk of secondary haemorrhage. However, there is minimal evidence to support its use in bleeding, with a large retrospective series noting no influence on rehospitalisation, repeat surgery or haemorrhage.¹⁰⁸ Moreover, following on from numerous case reports of fatal and near-fatal air emboli during varying surgical procedures,^{109,110} the UK Medicines and Healthcare products Regulatory Agency advised against the use of hydrogen peroxide in any closed body cavities or on deep or large wounds.¹¹¹

Fibrin-based biomaterials in the forms of glue and patches have previously been used to good effect following other ENT operations, such as endoscopic sinus surgery and management of epistaxis.¹¹² Unfortunately, trials investigating their use in tonsillectomy patients have had more mixed results. A systematic review of seven trials found that fibrin sealants demonstrated no significant reduction in post-operative pain scores or bleeding compared with electrocautery.¹¹³

Conclusion

In conclusion, despite the widespread belief that post-tonsillectomy haemorrhage is an infective process, there is scant evidence to support infection as a major confounding factor. Although certain retrospective series have suggested more severe infections with presence of group A streptococcus on blood culture, and recurrent tonsillitis may eventually result in a higher rate of post-tonsillectomy haemorrhage, there is no prospective published data on the prevalence of positive swab cultures at the time of acute haemorrhage.

Prescription of antibiotics remains routine practice for many in post-tonsillectomy haemorrhage, yet the existing literature and regulatory agencies do not currently support their use, and there are no studies observing their effect during acute bleeding. In the absence of overt infective features such as pyrexia during post-tonsillectomy haemorrhage, we do not support the routine use of antibiotics either peri-operatively or during an acute presentation with post-tonsillectomy haemorrhage. Other interventions, such as the use of peri-operative tranexamic acid, have a growing evidence base and may be a more effective intervention than traditional management with antimicrobials.

Acknowledgements. The authors would like to thank the library staff at NHS Lanarkshire for their assistance in performing the literature review for this study.

Competing interests. None declared

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