Tonsillitis and sore throat in children

Abstract

Surgery of the tonsils is still one of the most frequent procedures during childhood. Due to a series of fatal outcomes after hemorrhage in children in Austria in 2006, the standards and indications for tonsillectomy have slowly changed in Germany. However, no national guidelines exist and the frequency of tonsil surgery varies across the country. In some districts eight times more children were tonsillectomized than in others.

A tonsillectomy in children under six years should only be done if the child suffers from recurrent acute bacterially tonsillitis. In all other cases (i.e. hyperplasia of the tonsils) the low risk partial tonsillectomy should be the first line therapy. Postoperative pain and the risk of hemorrhage are much lower in partial tonsillectomy (=tonsillotomy). No matter whether the tonsillotomy is done by laser, radiofrequency, shaver, coagulation, bipolar scissor or Colorado needle, as long as the crypts are kept open and some tonsil tissue is left behind. Total extracapsular tonsillectomy is still indicated in severely affected children with recurrent infections of the tonsils, allergy to antibiotics, PFAPA syndrome (periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis) and peritonsillar abscess. With regard to the frequency and seriousness of the recurrent tonsillitis the indication for tonsillectomy in children is justified if 7 or more well-documented, clinically important, adequately treated episodes of throat infection occur in the preceding year, or 5 or more of such episodes occur in each of the 2 preceding years (according to the paradise criteria). Diagnosis of acute tonsillitis is clinical, but sometimes it is hard to distinguish viral from bacterial infections. Rapid antigen testing has a very low sensitivity in the diagnosis of bacterial tonsillitis and swabs are highly sensitive but take a long time. In all microbiological tests the treating physician has to keep in mind, that most of the bacteria, viruses and fungi belong to the healthy flora and do no harm. Ten percent of healthy children even bear streptococcus pyogenes all the time in the tonsils with no clinical signs. In these children decolonization is not necessary. Therefore, microbiological screening tests in children without symptoms are senseless and do not justify an antibiotic treatment (which is sometimes postulated by the kindergartens).

The acute tonsillitis should be treated with steroids (e.g. dexamethasone), NSAIDs (e.g. ibuprofene) and betalactam antibiotics (e.g. penicillin or cefuroxime). With respect to the symptom reduction and primary healing the short-term late-generation antibiotic therapy (azithromycin, clarithromycin or cephalosporine for three to five days) is comparable to the long-term penicillin therapy. There is no difference in the course of healing, recurrence or microbiological resistance between the short-term penicillin therapy and the standard ten days therapy.

On the other hand, only the ten days antibiotic therapy has proven to be effective in the prevention of rheumatic fever and glomerulonephritic diseases. The incidence of rheumatic heart disease is currently 0.5 per 100,000 children of school age.

The main morbidity after tonsillectomy is pain and the late haemorrhage. Posttonsillectomy bleeding can occur till the whole wound is completely healed, which is normally after three weeks. Life-threatening haemorrhages occur often after smaller bleedings, which can spontaneously cease. That is why every haemorrhage, even the smallest, has to be treated properly and in ward. Patients and parents have to be informed
about the correct behaviour in case of haemorrhage with a written consent before the surgery. The handout should contain important addresses, phone numbers and contact persons. Almost all cases of fatal outcome after tonsillectomy were due to false management of haemorrhage. Haemorrhage in small children can be especially life-threatening because of the lower blood volume and the danger of aspiration with asphyxia. A massive haemorrhage is an extreme challenge for every paramedic or emergency doctor because of the difficult airway management. Intubation is only possible with appropriate inflexible suction tubes. All different surgical techniques have the risk of haemorrhage and even the best surgeon will experience a postoperative haemorrhage. The lowest risk of haemorrhage is after cold dissection with ligature or suturing. All "hot" techniques with laser, radiofrequency, coagulation, monopolar or bipolar forceps have a higher risk of late haemorrhage. Children with a hereditary coagulopathy have a higher risk of haemorrhage. It is possible, that these children were not identified before surgery. Therefore it is recommended by the Society of paediatrics, anaesthesiology and ENT, that a standardised questionnaire should be answered by the parents before tonsillectomy and adenoidectomy. This 17-point-checklist questionnaire is more sensitive and easier to perform than a screening with blood tests (e.g. INR and PTT). Unfortunately, a lot of surgeons still screen the children preoperatively by coagulative blood tests, although these tests are inappropriate and incapable of detecting the von Willebrand disease, which is the most frequent coagulopathy in Europe.

The preoperative information about the surgery should be done with the child and the parents in a calm and objective atmosphere with a written consent. A copy of the consent with the signature of the surgeon and both custodial parents has to be handed out to the parents.

Keywords: tonsillitis, tonsillectomy, intracapsular, extracapsular, antibiotics

Introduction and terminology

Importance of the tonsils in childhood and anatomical structure

The tonsils serve immune acquisition and immune defence by antigen presentation, which is why they contain T-lymphocytes, macrophages and germinal centres of B-lymphocytes [234]. They are the first and easiest-to-reach station of the mucosa associated lymphoid tissue system (MALT) in humans [25], [26], [147]. Since the main phase of the immune acquisition continues until the age of 6, the palatine tonsils are physiologically hyperplastic at this time [117], [157]. Then there is an involution, which is reflected mostly in a regression until the age of 12 [116]. The lymphatic tissue is separated by a more or less rough capsule from the surrounding muscle (superior pharyngeal constrictor) [159]. The palatine tonsils have a strong blood flow from four different vessels, the lingual artery, the ascending pharyngeal artery and the ascending and descending palatine arteries. These vessels radiate mainly to the upper and lower tonsil pole, as well as the exact centre of the tonsils laterally [234]. The tonsils have deep crypts to keep the organ surface as large as possible and to create a docking surface for potential antigens [60]. The crypts and their adjacent germinal centres are separated from each other by delicate connective tissue [132], [158] (Figure 1, Figure 2).

Figure 1: Specimen of a tonsil in keratine colouring after extracapsular tonsillectomy (10-year-old child). The long crypts with keratine on the surface are well-defined. (with kind permission of the pathologic institute at LMU, Prof. Ihrler)
Current facts about tonsil surgery

Currently, in Germany every year 48 of 10,000 children and adolescents undergo tonsillectomies, so that we are ranked in 3rd place among the OECD countries. This intervention is the most common inpatient surgery in childhood and adolescence under anaesthesia and the most common service of ENT departments in Germany. While in recent years the rate of complete tonsillectomies during childhood in Europe has decreased (see Figure 3), from 1970 to 2005 it has increased constantly in the U.S. from 13.7 to 15.3 per 10,000 children [64]. However, the indication for tonsillectomy has moved away from the recurrent tonsillitis towards the child’s obstructive sleep apnoea (OSA) [22]. Due to the accumulation of deaths following tonsil operations in children in 2006 in Austria, the Austrian Societies of Otorhinolaryngology and Pediatric Medicine fundamentally revised their indications for tonsillectomy in childhood and recommend a tonsillectomy in children under 6 years only in exceptional cases [150]. Especially for tonsillar hyperplasia with pediatric OSA, the much less dangerous and less painful partial removal of the tonsil (tonsillotomy) is to be preferred. Scherer et al. already indicated this development in Germany with extreme caution in 1994 [194]. Five years later, Hultcrantz and Linder from Sweden [103], [136] and then again in 2002 Scherer and Helling published the first results of laser tonsillotomy [92]. At that time, the complete, extracapsular tonsillectomy was the only accepted method [153] and this initially brought the authors plenty of ridicule in the professional societies. In fact, the partial tonsillectomy is not a new method [71]. Until the development of general endotracheal anaesthesia all tonsils were actually only partially removed because an extracapsular tonsillectomy was technically not possible [62]. Meanwhile, the tonsillectomy has been rediscovered with modern methods (laser, radiofrequency, ultrasound), and in different countries in recent years similar guidelines have been published as in Austria with clear recommendations for partial removal of the tonsils [9], [14], [150], [169], [228]. A German S3-guideline was announced in 2008, but its completion has been postponed, as it is apparently difficult to reach interdisciplinary consensus. Hard facts for the years 2007–2010 on the incidence of tonsillectomy in childhood (1 to 19 years) for Germany are provided by the Bertelsmann Foundation at https://mandeloperation.faktencheck-gesundheit.de. There are very large regional differences: In some districts, eight times as many children have the tonsils removed as in the others. The authors of the Bertelsmann Foundation thereby see a connection between the local care by ENT inpatient and main departments (the higher the ENT department density, the more frequent the tonsillectomy) and the absence of clear guidelines in Germany. A closer look at the study, however, is striking in that for the three largest cities (Berlin: 27, Hamburg: 40, Munich: 33 per 10,000 children), despite their high density of ENT main departments, the number of tonsillectomies is significantly below the national average of 48 per 10,000 children. The authors conclude that in smaller ENT-departments the tonsillectomy, despite the comparatively low eff. cost weight of 0.44 (inpatient department) and 0.70 (main department, Source: DRG Grouper the University of Münster), is an important economic factor (Figure 4).

Terminology and ICD10 Classification

One problem with comparison of different studies is the different and imprecise terminology. This is evident not only in different countries and different languages, but also within the German literature various terms are called synonymous or different. The following definitions correspond to the majority (teaching) opinion and are used consistently within this paper as such:

**Acute tonsillitis (J03.0 - J03.9)**

English synonyms: severe tonsillitis [127], true tonsillitis, acute sore throat [81]; refers to a viral or bacterial tonsillitis with odynophagia, swelling and redness of the tonsils, possibly with tonsillar exudate, cervical lymphadenopathy and fever >38.3 °C rectal [150], [213]. An odynophagia for 24 to 48 hours, as part of prodromal symptoms of a common cold due to viral infection of the upper respiratory tract, is excluded from the definition of “acute tonsillitis” [81].

Depending on the stage and appearance of the deposits, or the exudate on the tonsils, one can distinguish the catarrhal angina with redness and swelling of the tonsils (early stage) from the follicular angina with stipple-like fibrin deposits from the lacunar angina with confluent deposits (late stage) [18], [19]. The diagnosis of “acute tonsillitis” can be made purely clinical by a specialist [213]. Smears, blood tests or viral evidence is not necessary in most cases [24], [76], [126], [212], [213].
Figure 3: Complete and partial resections of the tonsil in children and adolescents in the year 2007 to 2010 as inhouse procedures
(from: https://mandeloperation.faktencheck-gesundheit.de/fachinformation/ursachen-und-hintergruende/)

Figure 4: Number of children (max. 19 years old) who underwent tonsillectomy per year, pertained to 10,000 children per district. In some districts only 14/10,000 were tonsillectomized, in other districts 109.
Source: Faktencheck Gesundheit 2013, Calculation by IG ES, Daten Destatis, Bundesamt für Kartographie und Geodäsie
Chronic tonsillitis (J35.0 and J35.9)

English synonyms: chronic (hyperplastic) tonsillitis; although this term yields 1287 hits within a Medline search, it is unclear and misleading and should not be used [213]. Similarly, the term “Chronic tonsillitis with acute exacerbation”. Here, it seems likely that it is a chronic change in the tonsils with phased acute deterioration [221]. It is better to speak in such cases of (chronic) recurrent tonsillitis [29], [213], because there exists no real chronic tonsillitis with consistent symptoms for more than 4 weeks under adequate treatment and reconstruction of the mucosa (as in rhinosinusitis).

Acute recurrent tonsillitis (J35.0)

English synonyms: recurrent tonsillitis, recurrent throat infections [80]; refers to recurrences of acute tonsillitis. These are, in contrast to a single attack of acute tonsillitis, usually caused by many different bacterial pathogens [107], [216] and flare up again a few weeks after cessation of an antibiotic therapy [108]. Depending on the frequency and severity of such episodes, there is an indication for tonsillectomy.

Peritonsillar abscess (J36)

English synonyms: peritonsillitis; peritonsillar abscess; quinsy [75], [171]; called an acute tonsillitis with formation of an abscess, typically on one side [50]. The abscess may form in the intratonsillar, para-/peritonsillar or retro-tonsillar spaces. The pathogens are typically staphylococci [121], streptococci and fusobacterium necrophorum [119]. In contrast to acute tonsillitis, viruses play no role in an abscess [182].

Tonsil hyperplasia (J35.1 and J35.3)

English synonyms: tonsillar hyperplasia [172], (idiopathic) tonsillar hypertrophy [198]; refers to the abnormal enlargement of the palatal tonsils. This is to be distinguished from the physiological pediatric palatine tonsil hyperplasia [83], [157]. The pediatric tonsil hyperplasia is not a sign or consequence of recurrent inflammation [66], [172]. Also, children with tonsil hyperplasia do not suffer with an above average frequency of acute tonsillitis [93], [208] or middle ear infections [27]. A pediatric tonsil is only "pathologically” hyperplastic if one of the cardinal symptoms occur, namely rhonchopathy (with or without OSA), rarely dysphagia84 and even more rarely dysphonia [73].

Sore throat episodes (R07.0)

English synonyms: acute sore throat, throat infection; here it must be addressed in the context of the international literature, since there are over 16,000 articles, which deal with the unclear and imprecise term. The problem is that the term “sore throat” clinically does not distinguish between acute tonsillitis and pharyngitis. Thus, neither the cause nor the exact location must be determined [81]. Some authors (including the often cited paper by Paradise, JL [153]) distinguish between “severely affected throat infections” and “moderately affected throat infections” [155]. It still remains unclear whether it is an acute (bacterial) tonsillitis, which however is solely the basis of the indication for tonsillectomy [152].

Tonsillectomy (OPS 2013: 5-281.0)

English synonyms: (extracapsular) tonsillectomy; means that the entire tonsil, including its capsule and possibly also parts of the palatal arch, are removed from the tonsillar fossa. There is no longer any lymphatic tissue between the anterior and posterior palatal arch [1]. Since the late 1960s, with the discovery of the tonsil as a focus of infection [69], [70], [170], [231], this form of tonsil operation is recognized as the gold standard in the fields and is still cited as the most common surgery in the world [224] (Figure 5).

Figure 5: Intraoperative image after extracapsular tonsillectomy on both sides. Bare muscle fibers are apparent. Hemostasis was achieved by swap compression and punctual bipoliation.

Tonsillotomy (5-281.5)

English synonyms: partial tonsillectomy, tonsillotomy, means that only the medial portions of the tonsils are removed. This requires that the (well perfused) lymphatic tissues be severed, and the remaining crypts must remain open to the oropharynx [123], [194]. Active lymphatic tissue, with secondary follicles and crypts, remains in the tonsillar fossa on both sides [172] (Figure 6).
Intraoperative image after partial removal of the tonsils on both sides with radiofrequency current

Intracapsular tonsillectomy (5-281.0)

English synonyms: intracapsular/subcapsular or subtotal tonsillectomy; describes a method in which the lymphatic active tissue of the tonsil, including all crypts and follicles, is removed [32], [68]. However, the capsule of the tonsil is not broken and thus the underlying muscles are not exposed [59]. At the end of the operation there is an empty tonsillar fossa without the typical scarring [8]. A closer look at the literature, however, is striking that the intracapsular tonsillectomy is partially equated with tonsillotomy [36], [45], [102], [105], [122], [230] (Figure 7).

Cryptolysis (5-289.0)

Describes a procedure in which the tonsil tissue ring is laid bare around the crypt superficially and the crypt shrinks in the course. The lymphatic active tissue remains present and still intact. Most authors state that this intervention is to be performed on an outpatient basis under local anaesthesia and with the CO₂, diode laser or radio-frequency current [35], [49], [72], [124], [156]. Indications should be tonsil stones or foetor from the mouth.

Thermal or cryotherapy of the palatine tonsils (5-289.00 to 5-289.04)

Synonyms, or techniques: interstitial (electro)coagulation to the palatine tonsils, laser coagulation, thermal coagulation, cryocoagulation [4], [166], photodynamic therapy, ultrasound therapy [37], radiofrequency-induced thermotherapy [160], temperature-controlled tonsil treatment [47], [249], tonsil thermotherapy; means that the tonsil tissue defined interstitially is heated (or cooled) and then scarring subsequently results in shrinkage of the lymphatic tissue. Most authors see the indications with hyperplastic tonsils. No tissue is removed and a large part of the lymphatic tissue remains allegedly functional.

In principle, the interstitial thermodissipation is possible with all high frequency, radiofrequency or laser systems in the coagulation mode [162]. Most systems can however also cut and thus dissect the tonsil tissue. A laser or high frequency current therapy of the palatine tonsils can mean everything from the complete tonsillectomy to interstitial thermotherapy. In particular, the terms “tonsillotomy”, “cryptolysis” and “radiofrequency-induced/laser tonsil surgery” are often used interchangeably. Therefore, the material and methods section of the respective papers then have to be searched to determine exactly which type of therapy has been performed.

Conservative treatment measures and diagnostics

Pathogen spectrum, biofilms, normal findings

The findings on the responsible germs, especially in the chronic recurrent tonsillitis, have changed in recent years due to increasingly better detection methods [3], [40], [58], [107], [177], [216], [221]. While with the discovery of rheumatic fever, primarily the group A streptococci (GAS) were blamed for all the ills in the upper respiratory tract in the seventies [5], [63], [69], [70], [142], [170], [210], [231], recently there are anaerobes, such as Fusobacterium necrophorum, Streptococcus intermediae and Prevotella melaninogenica and histicola [107], [119], [120]. Few modern works illuminate the pathogen spectrum in the tonsils precisely. Swidinski and Lochs from the Charité in 2007 examined the pathogens of the tonsil in various stages of tonsillar life at times more precisely [216]. They found that children up to 8 years of age have a tendency towards a diffuse, intracellular pathogen enrichment with interstitial abscesses, while they could prove in adults or adolescents a more superficial bacterial accumulation at the edge of the crypts. Particularly in the case of recurrent tonsillitis, several pathogens and microorganisms play a role together. These are jointly able to form biofilms and bacteria clusters and thus evade antibiotic therapy [168]. The oral cavity and especially the furrowed tonsil is a reservoir for multiple pathogens.
(viruses and bacteria), parasites [146] and fungi [144].
However, all these microbes belong to the transient flora
and we live in symbiosis with them for aeones [107],
[195]. Jensen A. et al. were able to detect more than 100
bacteria in the tonsils of children and adults with and
without recurrent tonsillitis. 52 different bacterial strains
form the basis were detectable in each patient, whether
child or adult, whether sick or healthy. These represent
90% of the total pathogen load [107].

It almost seems that nearly all pathogens are detectable
in the sick, but also healthy tonsils with the proper
detection method. In acute tonsillitis, tonsil hyperplasia or
chronic recurrent tonsillitis obviously there is a change
only in the ratio in favour of some pathogenic germs
[107]. In the clinically acute tonsillitis in childhood the
streptococci still play the largest role with 30% [28], fol-
lowed by *Haemophilus influenzae* and *Neisseria* [107].
Mostly, however, mixed infections (viral and bacterial
initially) are responsible for the clinical picture [167]
(Figure 8).

Diagnosis

The diagnosis of “acute tonsillitis” in children and adults
can be made on purely clinical signs by a specialist [213].
Whereby it concerns mostly mixed infections (viral and
bacterial) [167]. In viral tonsillitis, in addition to pain and
fever, primarily cough, hoarseness, and rhinorrhea occur,
while in bacterial tonsillitis, in addition to pain with lymph
node swelling, there are mainly tonsilar deposits/exudate
and fever >38.3 °C [150]. A streptococcal antigen test
can confirm the diagnosis and is specific to 98% for
streptococci, although not particularly sensitive. There-
fore, the manufacturers recommend that in the event of
a negative test result, several tests should be performed
in a row. The tests are simple, fast (10 min) and cheap
(25 tests for 35.- Eur). Since the tests are freely available,
concerned parents also come with positive or negative
test results and demand (antibiotic) therapy from the ENT
doctor. One problem with these tests is the high number
of asymptomatic chronic carriers (10% of healthy children)
of staphylococci and streptococci, who are definitely not
in need of therapy [112], [113], [177], [219], [218],
[233]. Smears or bacterial and viral RNA rapid tests
should therefore performed only on symptomatic children
who are not yet classified [200]. In the early stage, the
distinction between viral and bacterial tonsillitis is often
difficult to make. Especially when one considers that in
97.5% of cases, at least one virus, even in the bacterial
 tonsillitis, is found (adenovirus and parainfluenza virus
respectively in 47.5% of the cases [59], [161]) [167].
These viruses appear, however, as does the Epstein Barr
virus in the pharyngeal tonsil [16], [115], often be clinically
occult. Thus, screening by using rapid tests (such as
required by some kindergartens or schools) does not
make sense because a lot of false-positive results are
found [200], [201]. The same may apply to the antistrep-
tolysin titre, which rises completely non-specifically in
 streptococcal infections that have occurred and then in-
creases over many years [200].

Antibiotic therapy

Chris Del Mar from Queensland, Australia, has worked
with the Cochrane Institute for many years on the exact
analysis of the effectiveness of antibiotic therapy for
throat pain (sore throat) and acute tonsillitis [52], [53],
[54], [149]. During the revision of its most recent meta-
analysis of 2010, the authors outlined a total of seven
usable studies with children under 18 years old [54]. In
clinically definite or proven bacterial tonsillitis associated
with distress, antibiotic therapy using a beta-lactam anti-
biotic is justified. It shortens the course of the disease
by an average of one day. Antibiotics reduce the fever
and reduce pain compared to placebo, most clearly on
the third day after administration. In addition, a beta-
lactam antibiotic therapy provides relatively reliable pro-
defection against the dreaded rheumatic fever and glomer-
ulonephritis, which often leads especially in third world
countries to arthritis, myocarditis and death. Some studies
have shown that antibiotic therapy can prevent sequelae
such as peritonsillar abscesses, acute otitis and sinusitis.
Also, a recent Cochrane analysis from 2013 showed the
effectiveness of different antibiotics in acute (streptococ-
cal) tonsillitis [226]. The penicilline, in particular in chil-
dren and adolescents, show the greatest benefit at the
lowest cost. There were no differences to cephalospori-
nes. Cephalosporines are, however, more effective in
children under 12 years of age and for chronic recurrent
tonsillitis, as they can eradicate more strains of strepto-
cocci [31]. Macrolides and clindamycin in children evoke
more side effects with the same efficacy and therefore
should be reserved only for proven penicilline allergy
sufferers [38], [39].

One advantage of modern macrolide antibiotics is a sig-
nificantly shorter duration of treatment, which should in-
crease compliance. As before, the duration of the recom-
mended standard therapy with penicillines for acute
streptococcal infection is 10 days [39], [118], [169]. With regard to the reduction of the course of the disease and the reduction of the symptoms, the short-term therapy with azithromycin (20 mg/kg) [46] for three days or clarithromycin and cephalosporin for five days is equal to the long-term penicillin therapy with better compliance [6], [7]. Also, the early discontinuation of penicillin after five days showed no disadvantages in the disease process, the rate of recurrence or the development of resistance [82]. Only the low-dose azithromycin (10 mg/kg) administration is not recommended because a significantly higher relapse rate could be demonstrated [7]. However, not considered in the short-term antibiotic therapies are the late complications of rheumatic fever and glomerulonephritis, which however are among the main arguments for a long-term beta-lactam antibiotic therapy for acute streptococcal tonsillitis, although the incidence of rheumatic fever in Europe is reported at only 0.5 cases per 100,000 children of school age [7]. A general postoperative antibiotic therapy does not make sense because it reduces neither the pain nor lowers the postoperative bleeding rate [2], [56].

Supportive therapy

Steroids

Oral or intramuscular steroids in children and adolescents also show a significant improvement in symptoms with minimal side effects and no negative effects on disease progression [89], [90], [91]. The best results were seen in proven streptococcal pharyngitis for dexamethasone (10 mg), as well as betamethasone (8 mg) and prednisolone (60 mg) with a clear reduction in the pain and feeling of illness, both in acute tonsillitis, and pharyngitis or sore throat [91].

Analgesics

Non-steroidal anti-inflammatory drugs have been used successfully for pain relief in children for over 40 years [145]. For acute tonsillitis, among the over-the-counter substances ibuprofen shows the highest efficacy with minimal side effects compared with paracetamol and acetylsalicylic acid (ASA) [225]. Another advantage of ibuprofen is longer duration of action of 6-8 hours in contrast to paracetamol. The therapeutic range of both substances is large and at the correct dosage, the safety potential is comparable [87], [88]. However, in the case of overdose with paracetamol, the liver damage is much harder to treat. In comparison, ASA shows significantly more gastrointestinal side effects and should not be used for acute tonsillitis with possible subsequent tonsillectomy due to the pronounced inhibition of platelet aggregation [138]. Diclofenac and ketorolac in children have fewer docking sites and are metabolized more quickly, which is why the dose should be adjusted (higher dosage than in adults) [74]. In the postoperative management these substances play a certain role in opioid conservation, but as first-line therapy in paediatrics they are not suitable for a sore throat [178], [179]. Metamizol is not recommended as an analgesic of the first or second choice in children due to the small but existing risk of agranulocytosis in the world literature [12].

Mouthwashes, phytotherapy, lozenges, Roeder method

Antiseptic mouthwashes with chlorhexidine or benzylamine have been tested in a study from Turkey (double-blind and placebo-controlled) and showed symptom improvement there in children and adults. Further studies are absolutely necessary to sufficiently prove efficacy [41], [42].

Typical herbal gargles contain sage, thyme and chamomile. They lubricate and maintain the mucous membranes. However, many contain ethanol as an extraction solvent and are not approved for children <12 years old [43]. Bionorica AG, Neumarkt, has received marketing approval for many herbal medicines for children and adults. Imupret® coated tablets or drops are suitable for tonsillitis. These are approved for children from 2 years and older and are intended to act as a 7-part combination anti-inflammatory and immunomodulatory [17]. Another herbal product of the company for children is Tonsipret®. It contains capsaicin, lignum vitae and pokeweed in homeopathic doses. Reliable clinical trials, however, were not found on homeopathy for acute tonsillitis.

Nasturtium and horseradish root are contained in Angocin® tablets from REPHA GmbH Biological Pharmaceuticals, Langenhagen. Both plants are said to have antimicrobial, antiviral and antifungal effects [43]. Pelargonium sidoides (EPs 7630), known as Umckaloabo from South Africa, is marketed in Germany for children and was able to show a significant symptom improvement compared to placebo in a clinical trial in children with sore throat (no proven streptococcal pharyngitis) [15]. No side effects were recorded [111]. In some studies, herbal formulas of traditional Chinese medicine have shown significant advantages or even superiority over antibiotics. However, not all these studies were GCP-compliant and not all have undergone a recent systematic review of their status [98].

Lozenges containing benzocaine numb the oral mucosa and are often offered in combination with Sialorheologika (Lemocin® Forte, Dobendan Strepsils®). The increased flow of saliva acts as a disinfectant, maintains the mucous membranes and accelerates the healing process [43]. These lozenges are, like all homeopathic and most herbal medicines, OTC medicines, i.e. sold only in pharmacies, but not refundable and usually for children 2 years and older.

In his book “The Natural Tonsil Treatment” of 1918, Roeder describes a method that is used more often today than earlier in many ENT practices. The detritus-filled tonsils are suctioned with a glass suction cup, thereby removing the debris and massaging the tonsils at the same time, which (according to the current viewpoint)
promotes lymphatic drainage [140]. Then the tonsils are brushed or sprayed with disinfectant solutions. However, this method is more difficult to apply in children because the suction procedure is quite painful.

Differential diagnoses

Often hidden behind pediatric tonsil hyperplasias, with or without recurrent infections, is a chronic nasal respiration obstruction or a chronic mouth breathing. In turbinate hyperplasia or deviated septum the cold, unfiltered, dry air flows past the tonsils, causes physical irritation, dries out the mucous membranes and maintains infections [21]. Furthermore, an allergy must be considered in principle with a chronic inflammation of the mucous membranes of the upper respiratory tract [183]. In particular, dust mite and mould allergy sufferers tend all year round (with peaks in winter) to experience infections of the tonsils and upper respiratory tract [114].

Another cause of recurrent tonsillitis is tooth decay [79]. Chronic mouth breathing and recurrent tonsillitis promote periodontal disease and tooth decay. Conversely, the (partial) tonsil removal can positively affect periodontal disease and even the complete pediatric dental state [55].

Especially with unilateral tonsillar hyperplasia, the differential diagnosis of lymphoma must be considered, particularly if unilateral lymph node swelling, reduced performance and fatigue occur [20].

Unilateral tonsillitis in children also allows as a differential diagnosis a Plaut-Vincent angina (first described by Plaut and Vincent (1894)) or a mucosal aphth. In the latter, pain is in the foreground, with only minimal visible results, while the Plaut-Vincent angina, caused by the spirochete Treponema vincentii and fusiform Fusobacterium (Fusobacterium nucleatum) manifests as large, dirty, onesided deposits, but causes hardly any pain and only minimal restrictions of the general condition [78].

Scarlet fever (A38) and mononucleosis (B27)

In acute tonsillitis two common subdiagnoses are highlighted: scarlet fever and the primary infection with the Epstein Barr virus (mononucleosis). Scarlet fever is caused by group A streptococci (primarily Streptococcus pyogenes). These must have a specific bacteriophage, which is responsible for the production of the scarlet fever erythrogenic toxin. When the toxin enters the skin, it results in the typical rash for scarlet fever [130]. Without this it is only a purulent tonsillitis.

There are several serotypes of this bacteriophage, each of which can cause the disease. Therefore, people can fall ill repeatedly with scarlet fever in the course of life [174]. The contamination is caused by droplet infection and contact via the mouth and throat. The tonsils show the typical fibrin stippling and the tongue is coated white at first, later the coating comes off and the tongue appears shiny red with protruding taste buds (strawberry or raspberry tongue). After one to four days, the characteristic rash is dense with pinhead-sized, red-coloured spots. Preferred sites are the armpits, the groin and the cheeks, while the mouth-chin-triangle remains free (perioral pallor or milk mustache). About 14 days after starting, it frequently results in a characteristic scaling of the skin on the finger or toe crests or even on the entire palms and soles of the feet. Scarlet fever resists very well to oral penicillin and can (as so often with pediatric diseases) range from a mild feeling of illness with sore throat to severe courses with fever, malaise, confinement to bed and exsiccosis [174].

Mononucleosis (synonyms: Pfeiffer fever, monocytic angina, Pfeiffer’s disease, students fever or kissing disease) is caused by the Epstein-Barr virus. Approximately 95 percent of Europeans under 30 years of age are infected with the virus. Especially in children under ten years old, the disease is often without symptoms; in the elderly usually flu-like signs of disease occur. Sometimes in adolescents it occurs as a severe course with severe sore throat and swollen, coated tonsils and large lymph nodes. Furthermore, splenic enlargement, loss of appetite, chills, dry cough, nausea and night sweats can occur [229]. In general, the disease occurs only once in one’s life, but as with other herpes viruses, the Epstein-Barr virus remains in the body for life and can be intermittently activated again (often incorrectly referred to as re-infection). It is transmitted by exchange of saliva (kissing disease) [100]. Simple coughing is not usually sufficient. Prolonged disease processes, extending in a weakened form sometimes over months and years, are rare. The Epstein-Barr virus can, as many other viruses also, trigger post-viral fatigue syndrome in adults. Such fatigue syndromes must be treated supportively (balanced diet, if necessary, nutritional supplements, no competitive sports, regular sleep). The therapy in the acute state consists of bed rest, adequate fluids and antipyretic drugs. Antibiotic therapy only makes sense with bacterial superinfection (in 10% of cases). Therefore, ampicillin and amoxicillin should not be used for therapy, as these in up to 90 percent of cases can lead to the formation of a rash (ampicillin exanthema) and pruritus. This rash may occur even after taking the antibiotic and usually requires about three days to fully spread across the body [229]. A tonsillectomy à chaud produces no benefit or shortening of the disease with a significantly increased postoperative bleeding risk [238]. It is indicated only in case of a complication (peritonsillar abscess, dyspnoea due to large tonsils) [34]. Currently, there is still no approved vaccine for the Epstein Barr virus, but several working groups are researching on it [44], [181].

Complications

In general, acute tonsillitis runs its course without complications and heals within three to four days. Rare but serious complications after strep tonsillitis are the glomerulonephritis and rheumatic fever, which triggers cardio-myopathies and rheumatic-like joint pain [69]. Early and
long-lasting (10 days) antibiotic therapy with penicillin or cephalosporins can reduce the frequency of both these complications by 70% [54]. In areas of the third world where rheumatic fever is more common, the prevention of this complication is the main argument in favour of penicillin therapy [54]. In Europe, the probability of rheumatic fever is so low that of twelve general practitioners only one will ever experience a new onset case [97]. A second, more frequent complication is peritonsillar abscess. This typically occurs on one side. But acute tonsillitis leads the way only in one third of cases [196]. Even the correctly performed antibiotic treatment of acute tonsillitis cannot really prevent peritonsillar abscess (in contrast to rheumatic fever) [164]. Since peritonsillar abscess is a potentially life-threatening situation and can rapidly spread to the neck soft tissues, the primary therapy in children and adults is urgent and surgical [94], [165], [196]. Whether the abscess is needle aspirated, incised or treated by tonsillectomy does not matter [165]. Before the operation, a high-dose steroid therapy, as well as penicillin and metronidazole should be administered, as is often done for mixed infections [165]. In only about 30% of cases after a peritonsillar abscess in children is there a relative indication for tonsillectomy in the interval [93] either because a renewed abscess occurs or because tonsillitis reoccurs. The postoperative bleeding risk is lower with the abscess tonsillectomy on the abscess side than on the opposite side, so with peritonsillar abscess in children a bilateral tonsillectomy à chaud must be discouraged [239]. If these children suffer recurrent tonsillitis in addition to the peritonsillar abscesses, it must be considered whether the increased risk of bleeding from the tonsillectomy à chaud can be accepted in order to prevent a possible second intervention in the infection-free interval.

Indications for surgery

Paradise criteria and guidelines in Europe

Austria, Italy, Croatia, the United States, Canada, the Netherlands and England have issued clear recommendations for tonsillectomy in their Guidelines [14], [133], [169], [176], [211], [228]. The Austrians and Dutch recommend tonsillectomy in children under 6 years old only in exceptional cases, otherwise the tonsillectomy is to be preferred due to a significantly lower risk. Interestingly, the Anglo-American countries did not mention the tonsillectomy at all and for tonsil hyperplasia with childhood OSA they see the complete removal of the tonsils as continuing to be indicated. Due to the good data situation in Europe, the tonsillectomy for children and adolescents with tonsilar hyperplasia and rare tonsillitis is always preferable to tonsillectomy [101], [212].

In recurrent tonsillitis, however, it comes down to the frequency, severity, and additional diseases (antibiotic allergies, immunosuppression, PFAPA syndrome). In these cases, most guidelines adhere to the so-called Paradise criteria that refer to a study by JL Paradise from 1984. It could be shown in a collective of n=187 children between 3 and 15 years old that a tonsillectomy significantly lowers the frequency of severe recurrent sore throat if it previously occurred

- 7 episodes/year in one year or
- 5 episodes each/year in two consecutive years or
- 3 episodes each/year of tonsillitis in three consecutive years [153]

The diagnosis “purulent tonsillitis” must however be medically documented and confirmed by elevated temperature >38.3 °C, tonsillar exudate, enlarged lymph nodes in the jaw angle, and performed antibiotic treatment [153], [154]. The authors also point out that only a few (not all) throat infections in the next 2 years can be prevented by tonsillectomy on average, and that 47 of 187 patients withdrew from the planned three-year follow-up [153]. For less severe sore throat inflammation or rarer frequency throat inflammation, the risk of tonsillectomy does not outweigh the benefits [155]. While the tonsils make a certain contribution to immune competence until 12 years old, a negative long-term effect on the immune system, however, cannot be proven [116]. Nevertheless, in children under 8 years of age, the indication for complete removal must be strictly made, since the risk of serious or fatal bleeding is further increased [241].

In contrast, in the tonsillectomy there remains lymphatic active tissue. This continues to grow in about 15% of cases, but rarely causes problems such as renewed snoring or recurrent tonsillitis [208]. The fear that after tonsillectomy frequent tonsillitis or peritonsillar abscess will occur is unfounded [65], [194], [205]. All crypts remain open during the laser, ultrasound, shaver, high-and radiofrequency technique [194], [205]. Mononucleosis or lymphoma is no longer any indication for extracapsular tonsillectomy. In peritonsillar abscess or unilateral tonsillitis it must be carefully weighed whether to operate on the inflammation-free opposite side since here a clearly elevated risk of bleeding exists (Table 1).

Surgical techniques

Extracapsular tonsillectomy

The world’s most commonly performed surgical technique in children and adults is the cold dissection. That is, the tonsils are dissected from the tonsil bed partly sharply and partly bluntly with a raspatorium and the scissors. The feeding vessels, especially at the upper and lower tonsil pole, are pinched off and then selectively ligated or coagulated with bipolar forceps. After removal of the tonsils, a dry swab is pressed for about 1 minute into the tonsil bed to stop the bleeding of small vessels. Some schools perform additional suturing of the lower pole (so-
Table 1: Summary of the different recommended therapies of the palatine tonsils

| Tonsilar disease                      | Therapy                                                                 |
|---------------------------------------|-------------------------------------------------------------------------|
| Acute tonsillitis with bacteria       | Analgesia (ibuprofene, local bezocaine, steroids and beta lactame antibiotics (i.e. after swab result) |
| Common cold                           | In most cases a virus! Analgesia and steroids                           |
| Recurrent acute tonsillitis with      | Complete extracapsular tonsillectomy                                   |
| Downtime and 5-7 episodes per year    |                                                                         |
| Tonsillar hyperplasia with ronchopathy| Partial tonsillectomy                                                  |
| Tonsillar abscess (quiny)             | Abcess drain via tonsillectomy punction or aspiration. Before surgery: beta lactame antibiotics + metronidazole, steroids and pain killer. |
| Mononucleosis                         | Analgesia, steroids, rest in bed, ultrasound of splen and liver, i.e. parenteral feeding. |

called pole suturing, a controversial method [232]). This method of tonsillectomy has been known for decades and has been very commonly used, especially in the 70s and 80s with the discovery of the tonsils as a source of infection [125]. Optical magnification aids (microscope or magnifying glasses), as described by M. Andrea for the first time, make it possible to specifically depict the afferent smaller vessels and perform bipolar coagulation before dissection [10]. In our study, however, no difference in postoperative pain was demonstrated (publication in preparation). Whether it is possible by this “more targeted” surgical technique to really reduce the rate of late postoperative bleeding, however, remains uncertain, as all studies involve small numbers of cases [10], [128]. The use of a surgical microscope with monitor certainly makes sense as part of the training.

Due to the good long-term results and low morbidity and mortality, the cold dissection, formerly, as now, is still the most common method of tonsillectomy [67].

Tonsillotomy

In recent years, the partial removal of the tonsil, the so-called “tonsilotomy”, has been rediscovered [106]. In this, the complete tonsil is not removed, but only the portion bulging into the throat, which due to its oversize gives rise to functional disorders. Thus, it remains a lymphatic and immunologically active rudiment.

More than 2000 years ago, tonsilotomy was performed with the fingers and various tonsil surgeries were carried out [71]. Regularly until the 90s and nowadays in the Netherlands the Sludert tonsilotomy was performed with the cigar-cutter like tonsillotome developed by Ph. Physick (1828) [141] or a guillotine-like forceps under local anaesthesia or sedation in less than 10 seconds (http://www.youtube.com/watch?v=WTEuyetSv9A). The tonsil is well supplied with blood and has to be sufficiently cut and coagulated (not crushed) during surgery so that there is no postoperative bleeding, infection or pain. To this end, several surgical procedures have been developed in recent years:

- Dissection with the CO₂ laser [222]
- Dissection with hot knife [131]
- Dissection with monopolar high frequency current [51]
- Dissection with the ultrasound scalpel [86]
- Dissection with bipolar radiofrequency coablation [160]
- Dissection with bipolar scissors [104]
- Dissection with argon gas-assisted monopolar needle [99]
- Removal of the excess tissue with the microdebrider [137]

In principle, a tonsillectomy can also be performed with all of these methods. The advantage of the tonsilotomy (regardless of what method is used to reduce the tonsils) is the significantly lower pain [205] and the lower postoperative bleeding rate [193] compared with the tonsillectomy.

Intracapsular tonsillectomy

All methods of tonsilotomy may also be used for intracapsular (subtotal) tonsillectomy. The tonsil capsule remains in the fossa and covers the underlying muscle [243]. Slightly less postoperative pain and earlier food intake are the result [202]. In the intracapsular tonsillectomy it is sometimes very difficult to determine the exact proportion of residual tonsil that remains. In particular, after some tonsillitis with subsequent scarring, it is difficult even with magnifying glasses or a surgical microscope to seek out the exact layer in the tonsil capsule and only remove the active lymphatic tissue. According to the literature the microdebrider has been useful for this [30], [148], [173], [202], [203], [227]. In adults feotor from the mouth or bothersome detritus in the crypts may be an indication. However, there is not one appropriate indication in childhood since tonsilotomy is indicated for tonsil hyperplasia and tonsillectomy is indicated for tonsillitis.

Cryptolysis

The same applies to the cryptolysis. Here individual crypts should be selectively heated, either with the laser or a
high frequency current. The procedure is performed under local anaesthesia and on adults (http://www.youtube.com/watch?v=5psyglSBow). In a new study from the United States, with laser cryptolysis the number of cases of acute tonsillitis should also be reduced after the procedure [124].

Thermotherapy/cryotherapy of the tonsils

Hyperplastic tonsils with rhonchopathy are specified as an indication. The tonsils are interstitially heated (http://www.youtube.com/watch?v=Sgr9Wzgr0mY) or cooled with a cryoprobe [134], [246]. In the course of 2 weeks, shrinkage of the fabric results with fully preserved tonsil capsule and surface. No tissue is removed and a large part of the lymphatic tissue remains supposedly functional. However, swelling of the tonsils, especially in the perioperative period, may occur, which with very large tonsils with already obstructive narrowing represents a contraindication. The risk of bleeding and the pain are minimal. The procedure can be performed under local anaesthesia, sedation or general anaesthesia. In principle, interstitial thermotherapy is possible with all high frequency, radiofrequency or laser systems in the coagulation mode [162] (Figure 9).

Postoperative pain

Operations on the tonsils, on the highly sensitive innervated mucosa and underlying muscle are extremely painful, especially if the capsule is broken and the muscle is exposed. Severe pain and superinfection of the wound bed can lead to prolonged healing courses with a longer hospital stay. In particular, adolescent and adult patients still report pain, exhaustion and fatigue weeks after surgery. Wound bed infections with inflammation of the lateral cords are blamed for this [139]. In the classical (extracapsular) tonsillectomy the wound remains open and heals in the next 2–3 weeks secondarily by granulation. Sealing the wound beds postoperatively (e.g. with fibrin glue [197] or sucralfate [186]) produces no advantage in postoperative bleeding or in pain management. The suturing of the palatal arch is controversial and is obviously dependent on the expertise of the surgeon [143], [199]. After classical tonsillectomy, for adolescents the pain in the first week after surgery, despite solid analgesic regimen, was around 5 on the numeric pain analogue scale (0–10), where in the morning and at meals particularly severe pain was reported [206]. With tonsillotomy, however, pain was reported as only around 2–3 on the numerical analogue scale, where here mostly children <12 years are affected. Less pain was also reported with the tonsillectomy than for teenagers and adults [129], [185]. In the intracapsular tonsillectomy there should allegedly be less pain than with the tonsillectomy [30]. However, it is unlikely that the intracapsular tonsillectomy reaches the low level of pain of the tonsillotomy.

Pain is inter-individually perceived very differently. In children and adults, the differences, regardless of the surgeon and the method, can be enormous [129], [206], [207]. Children of African descent suffer more postoperative pain than Europeans and react better to opiates for it [184]. This complicates both objective pain measurements (which do not exist), as well as a standard therapy. Pain therapy must therefore be individualized and adjusted, especially in children.

As a measuring method, numerical analogue scales have been provided for children with the Hicks version with laughing and weeping faces [223]. Questionnaires (e.g. Ramsay Sedation Scale [220]) for analgesic use, food intake, otalgia, kindergarten or school downtime are using
Postoperative bleeding occurs only very rarely. Therefore, late postoperative bleeding represents a special problem because it often occurs only at home and therefore the time factor in getting professional help and the proper response of the children or their parents play a major role. The most common cause of late bleeding is the physiological detachment of the fibrine layers from the open wound bed and usually results in harmless bleeding. This bleeding almost always ends spontaneously, or due to local icing (sucking ice cubes, applying an ice cravat) or by tranexamic acid intravenously or locally (ringing) [33].

If this bleeding does not spontaneously subside because, for example, a larger vessel is opened, a specific coagulation is used – vessel ligation or suturing under anaesthesia is required (in around 1–5% of children undergoing tonsillectomies) [190]. For every 50,000 extracapsular tonsillectomies there is however one life-threatening bleeding [240]. Such massive bleeding is signalled in most cases by a minor “warning bleeding” [188], [241], so any bleeding must be taken seriously and the patient must be hospitalized.

Postoperative bleeding depending on the selected method of surgery

In principle, intraoperative bleeding and postoperative bleeding can occur in all interventions involving the tonsils. However, for the tonsillectomy the postoperative bleeding rate is, by a factor of 5–10, lower than that for the tonsillectomy [95]. In cryolysis and thermoetherapy of the tonsils postoperative bleeding is a rarity [124], [160]. Thus, the extracapsular tonsillectomy remains really problematic. Here the “cold dissection” with ligature or suturing shows the lowest postoperative bleeding rates. After laser, coblation, monopolar or bipolar techniques, there seems significantly more severe late postoperative bleeding [190], [192], [244].

Postoperative bleeding depending on the surgeon

Even if many surgeons do not believe it or don’t want to hear it: the experience of the surgeon plays only a minor role in the severe postoperative bleeding [77], [190], [206]. Any surgeon can experience severe postoperative bleeding as soon as he or she has reached a certain number of tonsillectomies. The outcome of severe, transfusion-requiring postoperative bleeding is much more dependent on the emergency management and the frequency of tonsillectomies performed in each hospital [187], [189]. It was found in a Bavaria- and Saarland-wide survey that the main or inpatient departments that perform tonsillectomies more often have a lower percentage of postoperative bleeding requiring revision [248].
Postoperative bleeding depending on the preoperative coagulation status

Patients with untreated coagulation disorders have an increased risk of postoperative bleeding. Especially in children who undergo surgery for the first time, an increased bleeding tendency may have thus far gone undetected. The most common coagulopathy in Europe is the Von-Willebrand’s syndrome, an inherited quantitative or qualitative defect of von Willebrand factor, which leads to impaired platelet aggregation and faster degradation of coagulation factor VIII [23]. The problem with this clotting disorder is that it does not really stand out with an elevated PTT or INR [61]. Therefore, preoperative screening methods using INR and PTT are pointless. Sensitive (97.6%) [61] and simple is the standardized bleeding history of the child and the parents (17-point checklist) [96]. This is also recommended by the professional associations of Paediatrics, Anaesthesia and ENT [96]. A specially conducted survey, however, showed that in Bavaria only about a third of operative ENT doctors follow this recommendation [248]. INR and PTT are still frequently determined. A pathological history for a child should be clarified by a coagulation specialist. Despite appropriate preoperative and postoperative treatment, the risk of postoperative bleeding is usually higher than in healthy children [245]. Therefore, children with coagulation disorders should be hospitalized and operated on at a medical centre featuring transfusion medicine and hemostasis and with longer follow-up [214].

Management of postoperative bleeding

As soon as the preoperative stage, the patient or the parents should be advised that children, in particular, after a classic tonsillectomy must be constantly monitored (especially at night) for a period of about 3 weeks so that in case of postoperative bleeding medical help can be immediately summoned. A corresponding fact sheet should be provided after each tonsillectomy (e.g. on http://www.hno.at/fileadmin/hno/pdfs/Merkblatt_Verhalten_bei_Nachblutung_nach_TE.pdf). Physical exertion and travel should be avoided, and medications that contain aspirin or warfarin should not be taken at this time because they increase the risk of bleeding. Each postoperative bleeding, even “minor”, which subsides spontaneously, must be taken seriously (warning bleeding). An inpatient admission is semi-essential because the likelihood of further, more severe bleeding after bleeding has taken place is increased by five times [23]. If the urgency permits, the patient should be taken by paramedics or, if necessary, a medivac helicopter to the nearest ENT main department or surgical department with ENT specialist care. Transportation by one’s own private car should only be performed in exceptional cases and with short distances to the nearest ENT department. This is because there is a particular life-threatening danger either due to the risk of bleeding to death, because toddlers in particular have a small blood volume and can swallow a relatively lot of blood unnoticed, or by suffocation as a result of inhalation of blood into the lower respiratory passages. For the emergency physician, the intubation of massive postoperative bleeding after tonsillectomy is an extreme challenge, which can only be accomplished with a suitable rigid tonsil suction device (Figure 10).

In the hospital it must be decided whether the child must be moved immediately to the operating room, or can initially be treated conservatively with ice and hemostyptic drugs (e.g. oral and i.v. tranexamic acid [33]). In any case, a large-bore access should be created and blood re-
Inpatient or outpatient treatment and billing

After a classical tonsillectomy children should, for at least 3–4 days and possibly longer, be postoperatively monitored as an inpatient. Inpatient treatment is medically useful:

- because of the risk of rare emergency bleeding;
- for treatment for more severe postoperative pain;
- for the management of postoperative food intake and sufficient hydration.

The decision on the duration of the hospital stay must ultimately be made in each individual case by the attending otolaryngologist in consultation with the patient and, if necessary, the parents. An extension of the inpatient stay is for example useful:

- for treatment of postoperative food intake and sufficient hydration.

If the bleeding does not stop or becomes more severe (blood dripping from the mouth), surgery must be performed under general anaesthesia. During introduction and intubation, the ENT doctor should be present and prepared to perform cricothyrotomy. Aspirated blood or incorrect intubations are the most common clinical complications of postoperative bleeding [242]. Intraoperatively, the specialist must decide whether a targeted bipolar coagulation and swab pressure are sufficient or whether suturing or ligations are necessary. If that is not enough, either the lingual artery, ascending pharyngeal artery, facial artery or even the external carotid artery must be ligated from the outside or through an interventional radiology the feeding vessels must be sealed.

After each surgical intervention because of postoperative bleeding a child should be hospitalized and monitored for several days. After each bleeding (even minor) a child should be monitored for at least 24 hours. With bleeding children may swallow the blood in any case because it triggers first, nausea and vomiting, and secondly, it cannot be guessed how high the actual blood loss was.

Patient information and clarification

A patient brochure with behavioural guidelines after tonsillectomy and especially an emergency plan in case of postoperative bleeding should be given to parents before the inpatient stay. Here the closest hospital featuring an ENT department and in addition to the general emergency number (112) contact data for the attending physicians are shown (example of the Austrian Society for ENT on http://www.hno.at/fileadmin/hno/pdfs/Merkblatt_Verhalten_bei_Nachblutung_nach_TE.pdf). The clarification of the surgery must be performed well in advance (at least 24 hours before the surgery) and well documented. A conversation with a doctor must be carried out in each case and be documented in the patient record, for example with pre-printed sheets.

For children, the guardian or custodian must be included in the clarification and must sign the clarification. In cases of an unclear family situation it is advisable to have both custodial parents sign it.

Under the new patients’ rights law (Civil Code § 630e (2) paragraph 4) a copy of the clarification sheet must be given to the signatories, with separate custody and both parties. If one of the custodial parents refuses to consent
to the operation, the treatment can be carried out only after a court decision. The clarification of custody is a medical matter and belongs to the clarification.

In conclusion

It should be mentioned that at present nationally and internationally, the indication for the (partial) removal of the palatine tonsils is in flux and the ENT surgeons must be aware of their great responsibility when determining indications, especially in children. This is particularly difficult to correctly estimate, because actual major evidence-based studies on indications and effects hardly exist. Since tonsil surgery, however, is still one of the most common surgical procedures in ENT, it is urgently necessary to qualify more and more evidence-based studies to back up the positive effects of well-indicated tonsil operations for the future.

Notes

Competing interests

The author declares that he has no competing interests.

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