

Challenges in Rhinology

Cemal Cingi
Nuray Bayar Muluk
Glenis K. Scadding
Ranko Mladina
Editors



Springer

Challenges in Rhinology

Cemal Cingi • Nuray Bayar Muluk
Glenis K. Scadding • Ranko Mladina
Editors

Challenges in Rhinology

Editors

Cemal Cingi
Department of Otolaryngology
Eskisehir Osmangazi University
Eskisehir
Turkey

Nuray Bayar Muluk
Otolaryngology Department
Kırıkkale University, Faculty Medicine
Kırıkkale
Turkey

Glenis K. Scadding
Royal National ENT Hospital
London
UK

Ranko Mladina
Croatian Academy of Medical Sciences
Zagreb
Croatia

ISBN 978-3-030-50898-2

ISBN 978-3-030-50899-9 (eBook)

<https://doi.org/10.1007/978-3-030-50899-9>

© Springer Nature Switzerland AG 2021

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The inspiration for this book occurred when three of the editors (RM, CC, and myself) were floating on a gulet off the coast near Marmaris. After dinner, discussions turned to unsolved questions which we had asked ourselves over the years about Rhinology, our special subject. We realized that no one had put the answers to, or their pet theories about, these questions into a book—yet such a volume would be of use to many young Rhinologists, and even to their elders and to those in other related fields. Hence, the current volume.

Its gestation is also of interest since the initial version of most chapters has been researched and written by a young and enthusiastic specialist. This was then scrutinized and altered by one of his or her local mentors before being sent to a recognized expert in the field. Finally, I have read them all and made a few of my own suggestions, largely related to my own experience, or an update from recent papers.

The resulting volume has 49 chapters, written by over 100 authors from 21 countries—so it holds a widespread knowledge and expertise. The subjects range from basic anatomy and physiology, such as the importance of extra sinuses and the nasal cycle, through pathology: epistaxis, hyperreactivity, cerebrospinal fluid rhinorrhoea, rhinitis, and rhinosinusitis of all kinds, immune deficiency, to therapy: both medical and surgical.

Budding rhinoplasty surgeons will find plenty to occupy them: Chapters 22–29 concern this fascinating subject and show how the practice has evolved in recent years. Those who use medical treatments have multiple chapters concerning allergic rhinitis, local allergic rhinitis, paediatric rhinitis, chronic rhinosinusitis with and without nasal polyps. Therapies such as aspirin desensitization, combination sprays, complementary medicine, anti-fungals, allergen-specific immunotherapy, and biologics are included.

There are chapters suited for ear specialists, such as the significance of rhinitis in otitis media with effusion or whether the perforated eardrum is analogous to an accessory sinus ostium. Those who treat cough have Chaps. 42 and 44. Lower airways are also included in Chaps. 40 and 41, where the concept of united airways is explored and whether treating rhinitis helps asthma is discussed. Chapter 33 is devoted to optimal anaesthesia for nasal surgery, and the final chapter concerns forensic aspects of Rhinology.

Our hope is that this book will act as a wise elder to whom the Rhinologist can turn for answers to many of their questions. If there are some with which we have failed to deal, please let us know.

London, UK
April 1, 2020

Glenis K. Scadding

Contents

1	Is the Nasal Cycle Real? How Important Is It?	1
	Nihat Susaman, Cemal Cingi, and Joaquim Mullol	
2	Are There Additional Nasal Sinuses? Do They Matter?	9
	Ranko Mladina	
3	What Is Nasal Hyperreactivity?	15
	Mümtaz Taner Torun, Cemal Cingi, and Glenis K. Scadding	
4	What Is Vasomotor Rhinitis?	25
	İbrahim Arslan, Nuray Bayar Muluk, and Mario Milkov	
5	Cobweb Rhinitis: Arachnoidal Rhinitis—The New Clinical Entity in Rhinology	39
	Ranko Mladina	
6	What Is Honeymoon Rhinitis?	51
	Murat Koçyiğit, Nuray Bayar Muluk, Gordon Soo, and Jeffrey C. Bedrosian	
7	Recurrent Epistaxis from Kiesselbach’s Area Syndrome (REKAS)	57
	Ranko Mladina	
8	Local Allergic Rhinitis: A New Allergic Rhinitis Phenotype.	65
	Emine Ece Özdoğru, Nuray Bayar Muluk, and Carmen Rondon	
9	Recent Combination Therapy Options for Allergic Rhinitis	75
	Kemal Kef, Nuray Bayar Muluk, Iordanis Konstantinidis, and Glenis K. Scadding	
10	Does Allergy Cause Chronic Rhinosinusitis with Nasal Polyps?	83
	Erkan Esen, Eugenio De Corso, and Glenis K. Scadding	
11	Is Allergen-Specific Immunotherapy (AIT) Helpful in Treating CRSwNP?	93
	Meltem Tendoğan Avcı, Cemal Cingi, and William Reisacher	

12	Does Aspirin Desensitisation Work in N-ERD?	99
	İşıl Çakmak Karaer, Nuray Bayar Muluk, and Glenis K. Scadding	
13	Complementary and Alternative Medicine in Allergic Rhinitis	109
	Ali Bayram, Cemal Cingi, and Oren Friedman	
14	Sneezing and Nasal Discharge as a Barrier in Communication During Adolescence.	121
	Can Cemal Cingi, Erhan Eroğlu, and Gary L. Kreps	
15	How Should Rhinitis Be Managed During Pregnancy?	127
	Murat Kar, Nuray Bayar Muluk, and Hesham Negm	
16	Paediatric Rhinitis and Rhinosinusitis	137
	İsmail Salcan, Nuray Bayar Muluk, and Gabriela Kopacheva-Barsova	
17	Have Technical Advances Improved CRS Outcomes?	153
	Ranko Mladina	
18	What Is the Significance of Rhinitis in Otitis Media with Effusion?	159
	Mustafa Altıntaş, Nuray Bayar Muluk, and Kevin A. Peng	
19	Is There Any Analogy Between the Defect of the Eardrum in Chronic Otitis Media and Defect of the Fontanel (Two Holes Syndrome) in Chronic Maxillary Sinusitis?	169
	Ranko Mladina	
20	Approaches to Repairing Skull Base Defects for the Prevention of Cerebrospinal Fluid (CSF) Leakage	177
	Faruk Altınel, Ali Arslantaş, and Jeffrey Janus	
21	Imaging of Cerebrospinal Fluid Rhinorrhea	199
	Aslıhan Semiz-Oysu, Aslı Şahin Yilmaz, and Nafi Aygün	
22	Who Really Needs a Rhinoplasty?	217
	Demet Yazıcı, Cemal Cingi, and Dario Bertossi	
23	Which Approach Should Be Applied in Rhinoplasty: Open or Endonasal?	225
	Serkan Çayır, Cemal Cingi, and Norman Pastorek	
24	Selfies and the Rising Demand for Rhinoplasty	233
	Mehmet Emrah Ceylan and Can Cemal Cingi	
25	Assessment of Angulation Deformities of Lower Lateral Cartilages and Their Restoration	243
	Aret Çerçi Özkan, Cemal Cingi, and Regan Thomas	
26	Preservation Rhinoplasty	263
	Seçkin Ulusoy, Cemal Cingi, and Yves Saban	

27 Suture Lift of the Nasal Tip	277
Sinan Eroğlu, Cemal Cingi, and Grant S. Hamilton III	
28 Fillers as a New Tool for Improving Nasal Appearance	285
Müge Özçelik Korkmaz, Cemal Cingi, and Gyu Sik Jung	
29 What Is the Ideal Packing and Ointment after Nasal Surgery?	297
Ali Seyed Resuli, Cemal Cingi, and Jivianne T. Lee	
30 The Best Time to Operate on Nasal Polyps	307
Ethem İlhan, Nuray Bayar Muluk, and Jeffrey C. Bedrosian	
31 Surgical Treatment for Inferior Turbinate Hypertrophy	317
Zeynep Önerci Altunay, Hüsamettin Yaşar, and Peter Catalano	
32 The Role of Allergic Rhinitis for Professional Voice Users	325
Necati Enver and Michael J. Pitman	
33 Ideal Anaesthesia in Nasal Surgery	337
Ferda Yaman, Birgül Büyükkıdan, and Sacit Güleç	
34 Are Antifungals Effective in Rhinosinusitis?	345
Semih Ak, Nuray Bayar Muluk, and Desiderio Passali	
35 How Does Nasal Polyp Formation Relate to Immunomodulatory Effects?	353
Fazilet Altın, Cemal Cingi, and Sanna Toppila-Salmi	
36 The Importance of IgE and the Uses of Anti-IgE	365
Hakan Güvenir, Cemal Cingi, Ljiljana Jovancevic, and Glenis K. Scadding	
37 When Should We Use Biologics in Rhinology?	377
Pinar Tunçbilek Özmanevra, Füsun Yıldız, and Sarah K. Wise	
38 Recent Advances in Olfactory Dysfunction Treatment and Rehabilitation	387
Ali Bayram, Cemal Cingi, and Philippe Rombaux	
39 Does Nasal Disease Cause Headaches?	397
Hasan Kazaz, Nuray Bayar Muluk, and Barry L. Wenig	
40 Upper and Lower Airways Interaction: Is the United Airway Disease Concept a Reflection of Reality? How Important Is It?	405
Alev Ketenci, A. Fuat Kalyoncu, and Stefano Del Giacco	
41 Does Rhinitis Pharmacotherapy Improve Control of Comorbid Asthma?	415
Funda Çelik Şenel, Arzu Yorgancıoğlu, and Alvaro A. Cruz	
42 Chronic Cough: Pathology, Causes and the Role of Rhinitis/Rhinosinusitis	429
Hilal Boyacı, Bilun Gemicioğlu, and Guy Scadding	

43	Occupational Rhinitis	439
	Kağan Sağlam, İbrahim Çukurova, and Klara Van Gool	
44	Upper Airway Cough Syndrome	445
	Tuğba Önyılmaz, Füsun Yıldız, and Suela Sallavaci	
45	Does Immunodeficiency Matter in ENT?	457
	Serkan Dedeoğlu, Nuray Bayar Muluk, Codrut Sarafoleanu, and Elena Patrascu	
46	Is an Ideal Nasal Drop Able to Reduce All Symptoms of Allergic Rhinitis?	471
	Ceyhun Aksakal, Görkem Eskiizmir, and Cemal Cingi	
47	The Threat from Emerging Virus Infections: Today and Tomorrow	489
	Zerrin Özergin Coşkun, Cemal Cingi, and Sergei Karpischenko	
48	Computational Fluid Dynamics: Analysis of a Real Nasal Airway . . .	501
	M. Kürşat Gökcan, S. Nafuna Wanyonyi, and Dilek Funda Kurtuluş	
49	Some Forensic Aspects of the Nasal Septal Deformities	519
	Ranko Mladina	

What Is the Ideal Packing and Ointment after Nasal Surgery?

29

Ali Seyed Resuli, Cemal Cingi, and Jivianne T. Lee

29.1 Nasal Packing

Nasal packing is an essential component of ENT surgery. Following many different surgical procedures on the nose, e.g. rhinoplasty, septoplasty, turbinate minimization or cautery, nasal packing plays a key role in preventing haemorrhage or crust formation and, on occasion, helps secure flaps or grafts in the correct alignment. The range of products composed of various materials and marketed for use as packing has been steadily growing [1].

Nasal packing materials need to:

- Promote haemostasis following nosebleeds or an operation.
- Offer structural support to cartilage or bone, the conchae or other soft tissues (such as to an advancement flap).
- Stop adhesions forming or stenosis developing, particularly after sinus procedures. This kind of pack needs to remain in place for a more extensive period [2]. Struts [2–4] and some materials offer particular benefit in these uses.

What material a pack should be made of, the indications for placement and the duration of packing remain unresolved issues at present [6, 7].

A. S. Resuli (✉)

Medical Faculty, ENT Department, Istanbul Yeni Yüzyıl University, Istanbul, Turkey

C. Cingi

Medical Faculty, Department of Otorhinolaryngology, Eskisehir Osmangazi University, Eskisehir, Turkey

J. T. Lee

UCLA Department of Head and Neck Surgery Rhinology and Endoscopic Skull Base Surgery, Santa Monica, USA

e-mail: JTLee@mednet.ucla.edu

How do nasal packs work?

- Packing materials press on the tissues for haemostasis.
- They can occupy cavities to prevent adhesion formation.
- They preserve moisture by occluding the area, which then allows a return to non-pathological physiology.
- They form a barrier.
- They foster haemostasis and physiological wound repair.

29.1.1 Materials for Nasal Packs

29.1.1.1 Rubber-Covered Sponge Packs (Gummifingerlingtamponaden in German = GFT)

GFT is the name for a latex-encased sponge which is impermeable to microorganisms. Variation in the way the pack is manufactured can affect the quality of the latex and how securely thread retains the pack. An overly smooth thread runs the risk of slippage and may press unduly on the columella or the alar cartilages [1].

GFT placement is straightforward and rarely produces any injury, haemorrhage or pain. A variable pressure, ranging from slight to moderate, can be exerted on the mucosae [1].

There are, however, two important risks to consider [1]:

- The vestibulum of the nose may be traumatized, i.e. the columella and alar cartilages.
- If the pack slips backwards, there is a risk it may be aspirated.
- There is also a risk of toxic shock syndrome, if antibiotics are not prescribed prophylactically as these are nonabsorbable packs.
- These packs should be avoided in latex-allergic patients.

29.1.1.2 Expandable Nasal Packs

Expandable nasal packs are manufactured from the material polyvinyl acetate, viscose and cellulose (Sugomed) [1].

29.1.1.3 PVA Nasal Packs (=PVA-NP)

PVA nasal packs start off small in size and are available as several different types of different dimensions. The glue dissolves when it touches blood or water, allowing the pack to decompress and increase in size. The absorption capacity of the packs is 20 times their original weight. The material is soft and springy, so that a slight or medium pressure can be applied to the lining of the nose. How smooth and what size it is decide how easily a pack can move. A very small pore size means that granulation tissue does not spread into the pack itself, and that means a smoother pack will be easier to remove without causing pain or bleeding. Small pore size also results in a denser pack and one which better resists stretching. Liquids are absorbed more gradually, and less liquid is taken up by the pack. The most well-known PVA-NP is

Merocel. The big pore size of this material, nonetheless, means that it and similar products are unsuitable for nasal packing [1].

An ideal PVA-NP:

- Has minimal pore size, making it more comfortable to remove (3.08 versus 5 on a VAS 0–10, series 5000) [8].
- Has a coating on the sides (like Merocel Laminated) consisting of a composite material, which decreases tissue injury still more. The front, back, top and bottom of the pack need a rough surface with large pores.
- Should possess antimicrobial activity against *Escherichia coli*, staphylococci, *Yersinia* spp., *Serratia* spp. and *Bacillus subtilis* [1].

29.1.1.4 Sugomed

Sugomed comes in strip or plate form and is capable of expansion. It is composed of cellulose (31.3%) and viscose (68.7%). Liquids are absorbed, making the material swell, albeit not as much as PVA-NP. The pores are finer than the original Merocel, which increases patient comfort when taking the pack away, but packs with a smoother surface are still superior in this regard. The principal reason to prefer Sugomed over Merocel is that the packs can be personalised in terms of dimensions and form. Some surgeons use one long strip to go inside both nostrils. Doing this carries the risk of putting pressure on the columella [1].

29.1.1.5 Rapid Rhino

Rapid Rhino refers to a nose pack, the inside of which is spongy. Several types exist, e.g. Riemann, Goodman or Mannheim, and length varies. There also exists a balloon coated with carboxymethyl cellulose (CMC). CMC coats both parts, i.e. the balloon catheter and the spongy inner layer. The pack exerts pressure and closes gaps in the nasal cavity. Thus, it is a kind of formed nasal pack. Whilst it is known that platelets aggregate in response to CMC, which has beneficial haemostatic effects, this is probably only a minor part of how the pack works. When CMC is mixed with water (not saline, however), a gel results which has a smooth consistency and is beneficial in membranous recovery. This is a key part of how the pack with a spongy inner layer functions, but it is probably a minor element in how the balloon catheter-type pack achieves its benefit. The packs have nylon threads sewn into them, and this may stick to the mucosa and prevent the pack from being easily taken out. The benefits of the gel, i.e. occlusion of injury and restoration of physiological homeostasis, are available separately as CMC. This is sold as a Sinu-Knit or Stammberger gel [1].

Rapid Rhino has been shown to offer superior patient comfort, defined as pain whilst being put in place and taken out, or nosebleed [9, 10]. Rapid Rhino is also effective in individuals with a nosebleed or following sinus operations [9–12].

29.1.1.6 Cotton Gauze Strips

Cotton gauze strips vary in terms of how wide they are, the calibre of the knit and what type of threads are integral [1].

29.1.1.7 Balloon Packs/Balloon Catheter

Possibly the only reason to use balloon packs is for a grave nosebleed originating in the posterior nasal cavity. They are effective and swift in this indication. Whilst balloon packs do not occlude the branches of the sphenopalatine artery in a direct fashion, they can isolate the nasopharynx. Once the front of the nasal cavity has been blocked off, the rest of the cavity can be pressurised to put pressure on the leaking blood vessels. The most basic balloon packs use a single balloon. Others have twin balloons to place within the nasal cavity and the nasopharynx. Twin catheters do, however, carry the following risks [1]:

- The anterior balloon puts pressure on the nasal septum and turbinates and may cause necrosis, rather than directly compressing the leaking arteries. The balloon pushes the septum over to the other side [13]. In a case where the anterior balloon is directly compressing a bleeding vessel, a similar therapeutic effect can be achieved with diathermy or a less invasive placement of nasal packing.
- The vestibulum of the nose is prone to injury, particularly if the catheter is too short. This means long packs are needed each time.
- It is not generally necessary to undertake sinus surgery unless the posterior plate of the maxillary sinus is hard to find.
- Many arterial branches may exist [14].
- Simmen states that the branch of the artery supplying the anterior plate of the sphenoid sinus is the most commonly affected.

Balloon packs possess a greater degree of sophistication than Foley catheters, but the latter can achieve the same result at a lower cost. All balloon packs suffer from problems in securely attaching the catheter. Necrosis of the ala is also a problem. Several suggestions have been offered as to how this danger can be minimized:

- Secure the nasal pack anteriorly with a very secure knot.
- Coat the surface with foam [15].
- The distal end is cut and positioned 8 cm further than the proximal end of the dilated balloon and clamped into place [16].

29.1.1.8 Hemostatic/Resorbable/Biodegradable Packs

Patients now expect to be more comfortable following sinus operations than was previously the case. Some ENT clinicians have made the decision not to use nasal packs at all, since they carry several risks. Novel products have come into the market to fill this gap, but these products cannot press nor support, as conventional nasal packs used to do. The older products had the following drawbacks [1]:

- The pack exerts pressure when in place that can damage the cilia of the mucosa. This may also occur due to injury when placing or taking out a pack.
- Taking away the pack can cause injury and haemorrhage.
- Packs may be uncomfortable because of the pressure they exert.
- There are other, more detailed risks.

In nasal septal operations, nasal packs are unnecessary provided specific suture techniques and splints are employed. In contemporary operations on the sinuses and conchae (done endoscopically), nasal packs are frequently unnecessary. However, aggressive conchal reduction or radical sinus surgery frequently results in profuse bleeding that calls for formed packs, as formed packs are the only means by which adequate pressure can be applied. Using more gentle endoscopic sinus surgical techniques not only offers comparable or superior outcomes from the operation but also lessens the disadvantages, such as crusting, scar or bone spur formation after injury trauma. As a final note, more comfortable nasal packs can be utilised [1].

Combining materials in various ways can achieve a variety of aims [1]:

- Haemostasis.
- Taking advantage of adhesive quality to position tissues.
- Barrier formation.
- Better recovery from trauma.
- Ability to seal a surface or cavity.

29.1.1.9 Gelatine (Gelfilm, Gelfoam)

Researchers in the US report on the application of gelatine obtained from porcine skin to the osteomeatal unit or ethmoid following sinus operations. This was carried out as well as positioning a nasal pack. When this material was applied in the sinuses, scar formation increased, adhesions were formed, and the maxillary meatus narrowed [17–19].

29.1.1.10 Bovine Gelatine Plus Thrombin (Floreal)

Floreal gel possesses high viscosity and aids in haemostasis. It can stick even to rough or wet surfaces like those in the nasal sinuses, even if the haemorrhage is extensive [20]. It may be employed in individuals with platelet deficiency or with abnormal platelet activity. Floreal is the highest rated haemostatic pack [5, 21]. Nonetheless, there are also several disadvantages:

- Scarring and adhesion formation is more common [22–26].
- Foreign body reaction may occur, and the foreign body may become integrated into the mucosa, even where no injury was present [25, 26].

29.1.1.11 Hyaluronic Acid (I.E. Merogel (Esterified Hyaluronic Acid), Sepragel (Hyaluronic Acid Polymers with Cross-Linkage), Seprapak (CMC in Combination with Hyaluronic Acid))

Hyaluronic acid (HA) occurs naturally as an unbranched polysaccharide (glyco-amino-glycane) consisting of repeating disaccharide units of sodium-d-glucuronate and N-acetyl-d-glucosamine. It is located in the basal membranes of cells and soft tissues. It plays a key role in cellular increase and migration. HA is a vital element in the repair of injury in the foetus, a process with virtually absent scar formation [1].

29.1.1.12 Other Hemostatic Materials

Fibrin adhesive has been employed in nosebleeds, coagulopathies, nasal septoplasty and sinus operations [27]. This adhesive has lower associated oedema, crusting and atrophic cicatrification than diathermy, silver nitrate application or nasal packing, when used to manage nosebleeds. At present, its role in sinus surgery has not been fully evaluated.

29.2 Ointments on Nasal Packs

Typically, surgeons employ vaseline or antibiotic ointments. Ointments allow for frictionless insertion of strips and the prevention of crusting. It is assumed that antibiotics stop infections, although this has not yet been experimentally confirmed. Cotton gauze strips should not be utilized post-surgically on the septum, conchae or sinuses as they are not very effective [1].

Ointments may be mixed according to the clinician's inclination, before application to nasal packs.

One possible combination is ciprofloxacin, ketoprofen, ephedrine hydrochloride and lanolin, which has the following advantages:

29.2.1 Ciprofloxacin

Topical preparations have the benefits of delivering the agent precisely to the lesion and achieving a high localised bioavailability without a correspondingly high systemic concentration. Drawbacks are that it may be difficult to apply to the lesion, there may be localised side effects, such as nosebleed or pain, and entry into the sinuses may be hit-and-miss. However, as the nasal cavity and sinuses are generally straightforward to access, this is a popular site for topical treatments and topical preparations are now integrated into the treatment of chronic rhinosinusitis, for example. Oral ciprofloxacin has been shown to achieve a higher concentration in the mucosa than a topical ointment in patients with chronic rhinosinusitis, but at the cost of a high plasma concentration, and gel was seen to be the best form for a topical preparation of ciprofloxacin [28].

29.2.2 Ketoprofen

Ketoprofen is a non-steroidal anti-inflammatory drug (NSAID) and its mechanism of action is the inhibition of the cyclo-oxygenase enzyme, which is a key enzyme in the synthesis of the prostaglandins. Prostaglandins are pro-inflammatory modulators. Inhibition of prostaglandin synthesis has the effect of dampening down the inflammatory response. Topical ketoprofen has been employed as analgesia and anti-inflammatory in the following conditions: minor bruising injuries, tendonitis, osteoarthritis of distal joints, acute lumbar pain and phlebitis [29].

Topical ketoprofen preparations exist as creams, gels, solutions, sprays and plasters, with a variety of proprietary as well as generic products on the market [29]. The rationale for the inclusion of ketoprofen in an ointment for nasal application is to shorten the duration of wound healing.

29.2.3 Ephedrine Hydrochloride

Nasal blockage resulting from several different disorders that affect the nose is commonly managed through the use of nonselective adrenergic alpha-agonists, e.g. phenylpropanolamine and d-pseudoephedrine [30]. Since both ephedrine and pseudoephedrine cause vasoconstriction to the lining of the nose, they are very suitable to prevent nasal congestion from developing [31].

How the plexus of vessels which supply the mucosal lining of the nose is regulated has a profound effect on the engorgement of blood in the venous sinuses, which then causes mucosal swelling, leading to the lower flow of air through the nose. Thus, any disturbance here leads to a perception of nasal stuffiness [10]. Both the venous and arterial sides of the vascular network are innervated by adrenergic fibres acting on alpha- (vasoconstrictive) and beta- (vasodilatory) receptors. The alpha-receptors are more preponderant [10]. Ephedrine and pseudoephedrine act on the vascular plexus via alpha-receptors to produce vasoconstriction and hence relief of nasal blockage. This improves the patient's quality of life.

29.2.4 Lanolin

Lanolin has benefits as it produces a frictionless surface and stops adhesions to the pack from forming.

Lanolin itself is a light yellow-coloured, sticky liquid which is extracted from sheep's wool. Melting lanolin gives it a non-cloudy yellow-tinged appearance. Although lanolin is sometimes referred to as wool fat or wool grease, since it does not contain glycerides, chemically speaking, it is not a fat. The main components are sterol esters; thus, it is more appropriately termed a wax [32]. Lanolin forms a physical barrier to adhesion to make packing easier to take out later. It must be avoided in lanolin allergic patients.

29.3 Conclusion

An ideal nasal packing material should possess the strength to keep the bones, septum and mucosal flaps in the desired position. It should compress vessels and thus staunch haemorrhage yet be sufficiently gentle to avoid irritation and patient discomfort whilst in place.

Any ointment over the pack serves to counter infection, oedema and crusting. If the ointment has a greasy quality, it will act as a lubricant for the insertion and removal of the nasal pack, rendering its use easier for both the surgeon and the patient.

References

1. Weber RK. Nasal packing and stenting. *GMS Curr Top Otorhinolaryngol Head Neck Surg.* 2009;8:Doc02. <https://doi.org/10.3205/cto000054>. Epub 2011 Mar 10
2. Weber R, Keerl R. Einsatz moderner Bild-Datenverarbeitung in der klinisch rhinologischen Forschung. *Eur Arch Otorhinolaryngol.* 1996;Suppl I:271–96.
3. Weber R, Hosemann W, Draf W, Keerl R, Schick B, Schinzel S. Endonasale Stirnhöhlenchirurgie mit Langzeiteinlage eines Platzhalters. *Laryngo-Rhino-Otologie.* 1997;76:728–34. <https://doi.org/10.1055/s-2007-997515>.
4. Weber R, Mai R, Hosemann W, Draf W, Toffel PH. The success of 6-month stenting in endo-nasal frontal sinus surgery. *ENT J.* 2000;79:930–41.
5. Weitzel EK, Wormald PJ. A scientific review of middle meatal packing/stents. *Am J Rhinol.* 2008;22:302–7. <https://doi.org/10.2500/ajr.2008.22.3171>.
6. Weber R, Hochapfel F, Leuwer R, Freigang B, Draf W. Tamponaden und Platzhalter in der endonasalen Chirurgie. *HNO.* 2000;48:240–56.
7. Beule AG, Weber RK, Kaftan H, Hosemann W. Übersicht: Art und Wirkung geläufiger Nasentamponaden. *Laryngo-Rhino-Otologie.* 2004;83:534–51. <https://doi.org/10.1055/s-2004-825695>.
8. Bresnihan M, Mehigan A, Curran A. An evaluation of Merocel and Series 5000 nasal packs in patients following nasal surgery: a prospective randomised trial. *Clin Otolaryngol.* 2007;32:352–5.
9. Badran K, Malik TH, Belloso A, Timms MS. Randomized controlled trial comparing Merocel and rapid rhino packing in the management of anterior epistaxis. *Clin Otolaryngol.* 2005;30:333–7.
10. Singer AJ, Blanda M, Cronin K, LoGiudice-Khwaja M, Gulla J, Bradshaw J, Katz A. Comparison of nasal tampons for the treatment of epistaxis in the emergency department: a randomized controlled trial. *Ann Emerg Med.* 2005;45:134–9.
11. Cruise AD, Amonoo-Kuofi K, Srouji I, Kanagalingam J, Georgalas C, Patel NN, Baida L, Lund VJ. A randomized trial of rapid rhino Riemann and telfa nasal packs following endoscopic sinus surgery. *Clin Otolaryngol.* 2006;31:25–32.
12. Gudziol V, Mewes T, Mann WJ. Rapid Rhino: a new pneumatic nasal tamponade for posterior epistaxis. *Otolaryngol Head Neck Surg.* 2005;132:152–5.
13. McGarry GW, Aitken D. Intranasal balloon catheters: how do they work? *Clin Otolaryngol Allied Sci.* 1991;16:388–92.
14. Simmen DB, Raghavan U, Briner HR, Manestar M, Groscurth P, Jones NS. The anatomy of the sphenopalatine artery for the endoscopic sinus surgeon. *Am J Rhinol.* 2006;20:502–5.
15. Gehrking E, Weerda H. A modified nasal tamponade with foam rubber protection in epistaxis. *Laryngo-Rhino-Otologie.* 1995;74:463–4.
16. Ho EC, Mansell NJ. How we do it: a practical approach to Foley catheter posterior nasal packing. *Clin Otolaryngol Allied Sci.* 2004;29:754–7.
17. Catalano PJ, Roffman EJ. Evaluation of middle meatal stenting after minimally invasive sinus techniques (MIST). *Otolaryngol Head Neck Surg.* 2003;128:875–81.
18. Rust KR, Stringer SP, Spector B. The effect of absorbable stenting on postoperative stenosis of the surgically enlarged maxillary sinus ostia in a rabbit animal model. *Arch Otolaryngol Head Neck Surg.* 1996;122:1395–7.
19. Tom LW, Palasti S, Potsic WP, Handler SD, Wetmore RF. The effects of gelatin film stents in the middle meatus. *Am J Rhinol.* 1997;11:229–32.
20. Baumann A, Caversaccio M. Hemostasis in endoscopic sinus surgery using a specific gelatin-thrombin based agent (FloSeal). *Rhinology.* 2003;41:244–9.
21. Björnses K, Holst J. Various local hemostatic agents with different modes of action; an in vivo comparative randomized vascular surgical experimental study. *Eur J Vasc Endovasc Surg.* 2007;33:363–70.

22. Chandra RK, Conley DB, Kern RC. The effect of FloSeal on mucosal healing after endoscopic sinus surgery: a comparison with thrombin-soaked gelatin foam. *Am J Rhinol.* 2003;17:51–5.
23. Chandra RK, Conley DB, Haines GK 3rd, Kern RC. Long-term effects of FloSeal packing after endoscopic sinus surgery. *Am J Rhinol.* 2005;19:240–3.
24. Shrimel MG, Tabaei A, Hsu AK, Rickert S, Close LG. Synechia formation after endoscopic sinus surgery and middle turbinate medialization with and without FloSeal. *Am J Rhinol.* 2007;21:174–9.
25. Maccabee MS, Trune DR, Hwang PH. Effects of topically applied biomaterials on paranasal sinus mucosal healing. *Am J Rhinol.* 2003;17:203–7.
26. Antisdell JL, Janney CG, Long JP, Sindwani R. Hemostatic agent microporous polysaccharide hemospheres (MPH) does not affect healing or intact sinus mucosa. *Laryngoscope.* 2008;118:1265–9.
27. Vaiman M, Eviatar E, Shlamkovich N, Segal S. Use of fibrin glue as a hemostatic in endoscopic sinus surgery. *Ann Otol Rhinol Laryngol.* 2005;114:237–41.
28. Gameiro Dos Santos J, Figueirinhas R, Liberal JP, et al. On ciprofloxacin concentration in chronic rhinosinusitis. *Acta Otorrinolaringol Esp.* 2018;69(1):35–41. <https://doi.org/10.1016/j.otorri.2017.06.008>. Epub 2017 Aug 30
29. Ketoprofen topical. European Medicines Agency. <https://www.ema.europa.eu/en/medicines/human/referrals/ketoprofen-topical>. Accessed 20 Jan 2020.
30. Erickson CH, McLeod RL, Mingo GG, Egan RW, Pedersen OF, Hey JA. Comparative oral and topical decongestant effects of phenylpropanolamine and d-pseudoephedrine. *Am J Rhinol.* 2001;15(2):83–90.
31. Laccourreye O, Werner A, Giroud JP, et al. Benefits, limits and danger of ephedrine and pseudoephedrine as nasal decongestants. *Eur Ann Otorhinolaryngol Head Neck Dis.* 2015;132(1):31–4.
32. Lanolin Pharmaceutical Grade. https://www.fr-lanolin.com/product/products _description/Lanolin_Pharmaceutical_Grade.html. Accessed 20 Jan 2020.