ENT Diseases: Diagnosis and Treatment during Pregnancy and Lactation

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Editors

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Preface

The formation of a new and completely unique human being through the combination of genes from the parents is surely Nature's greatest miracle. Male pride leads many cultures to grant the father a leading role in procreation, but, biologically speaking, his contribution to pregnancy is over in a matter of minutes, whereas for the mother, the next 9 months are a time of vast changes as she literally builds a new human being within her body and prepares to accept her lifetime role as caregiver. Even once the child is delivered, the mother's body still miraculously produces all the sustenance a baby needs in the form of milk. *Mother* Nature indeed!

In physiological terms, both pregnancy and the postpartum period are special and complex periods in a patient's life. ENT disorders are highly prevalent throughout the lifecycle, but when they occur in pregnant patients or nursing mothers, they call for special care in treatment. Without a deep knowledge of this period in a patient's life, it is all too easy for an ENT practitioner inadvertently to harm both the mother and her developing child. For this reason, we decided to write the book you are now holding, *ENT Diseases: Diagnosis and Treatment During Pregnancy and Lactation*.

My sincerest thanks go to Mrs. Nuray Bayar Muluk, my co-author, whose patience and diligent industry have, once again, brought another major project to fruition. It is an honour and a pleasure to be able to collaborate with her.

I also owe a great debt of gratitude to Mr. Halil Erdem Özel for his great diligence and meticulous sensitivity as an authority on ENT matters. As the storm of COVID 19 raged, he remained steadfast in his efforts to write, even after both he and all his family were struck down by the disease.

It is our hope and wish that the current volume of 73 chapters, representing, as it does, a collaboration between 170 authors in 30 different countries, will prove a go-to reference for all clinicians who encounter ENT disorders in their work. Perhaps, too, it may serve as a source of reliable information for the growing numbers of pregnant and postpartum patients who, these days, seek out their own information online prior to getting an ENT opinion!

"God who gives life also gives sustenance."

But loving mothers and growing babies still need our protection and support...

Eskişehir, Turkey
1 July, 2022

Cemal Cingi

Preface

Clinical management of pregnant or breastfeeding mothers and their offspring presents unique challenges because of the way management directly impacts both maternal and child health. It necessitates the joint evaluation of two people who are vital to each other's welfare. Scientific knowledge in this challenging field has many limitations and is based, for the most part, on animal models and observations in humans. Accordingly, conjecture and probability often take the place of definite facts. Thus, not only the management of patients during pregnancy and lactation is a real challenge, but also the task of gathering and writing down reliable information for hard-pressed clinicians to consult. This book provides much-needed specific guidance on the management of ENT and lower respiratory tract diseases during pregnancy and the post-partum period. Additionally, it serves to inform clinicians about physiological changes in pregnancy and the post-partum period. A number of chapters that complete the picture or offer a different perspective on the core topics have also been included.

The first germ of an idea for this book was planted during my period of obligatory state service in a secondary care hospital in the initial years after I completed residency training. I observed that a significant portion of those attending outpatient clinics are women who are either pregnant, post-partum, or with a suspected pregnancy. The fact that these patients primarily attend regional primary or secondary healthcare centres may mean this important group of patients is rarely encountered in tertiary centres responsible for residency training. As a result, young specialists may lack adequate experience of ENT conditions in pregnant and post-partum women and their offspring. Furthermore, there are only limited recommendations, even in major ENT textbooks, regarding management in pregnancy and the post-partum period. I am confident that this book will contribute to filling an important knowledge gap and will become one of the key resources in this area.

Cemal Cingi, one of the editors of this book, is an exceptional scientist and clinician who has always cared deeply about the ideas of younger colleagues and supported them in projects. Precisely because of Prof. Cingi's reputation, it was to him that I presented my idea for this volume, when it first came to me as a young ENT specialist. The first stages in writing coincided with a time when COVID-19 had begun to spread rapidly. Prof. Cingi's support in the form of wise counsel and superlative organisational skills meant writing the book became a major boost to my morale, at an otherwise very trying time when I, my wife, and many other

colleagues were ourselves suffering from COVID-19, and has ensured the book will attract a wide readership amongst clinicians. Another editor, Nuray Bayar Muluk, through her devoted contributions, has brought the project to fruition, despite her own health problems. Many sincere thanks are due to the editors of the book.

For such a challenging subject, the authors have been at pains to take all the scientific data into detailed consideration, by conducting a thorough review of the evidence base before writing their chapters. Without their invaluable efforts, this book would not have been possible. I am grateful to all the authors for their diligence and industry. The meticulous attention of the publisher was vital to ensure the book could reach its current form. I also owe an immense debt of gratitude to our patients, who, as always, are our greatest teachers. I am delighted to present this book to our readers, whose suggestions and criticisms are welcome for future editions.

I dedicate this book to my dear wife, son, mother, and also to my beloved father, whose recent death was unexpected by any of us.

Derince, Kocaeli, Turkey
23 April, 2022

Halil Erdem Özel

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Ali Seyed Resuli, Muhammet Dilber, and Cemal Cingi

48.1 Introduction

Rhinorrhoea refers to a greater volume than the usual discharge of fluid from the nose. Patients complain of a runny nose. The liquid may be of varying viscosity, translucent or opaque, and may be discharged intermittently or continuously [1].

Pregnancy rhinitis (PR) is a type of persistent non-unfavourably susceptible rhinitis not present before pregnancy that shows itself during pregnancy with complete goal of manifestations after conveyance. Pregnancy rhinitis is characterised as nasal blockage in the last at least a month and a half of pregnancy, without different indications of respiratory plot disease and with no known hypersensitive reason, with complete goal of side effects inside about 14 days after conveyance. Pregnancy rhinitis happens in around one-fifth of pregnancies, can show up at practically any gestational week, and influences the lady and perhaps at the same time the baby [2].

The pathogenesis of pregnancy rhinitis is not clear, yet placental development chemical is recommended to be included. Smoking and refinement to house dust bugs are plausible danger factors. It is normally hard to make a differential analysis of sinusitis: endoscopy of a decongested nose is the symptomatic technique for

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decision. At times ultrasound or x-beam might be essential. Sinusitis ought to be dealt with forcefully with expanded portions of beta-lactam anti-infection agents and antral water system. Nasal decongestants give great transitory alleviation from pregnancy rhinitis, yet they will in general be abused, prompting the advancement of rhinitis medicamentosa. Corticosteroids have not been demonstrated to be powerful in pregnancy rhinitis, and their foundational organisation ought to be stayed away from during pregnancy. Nasal corticosteroids might be controlled in pregnant ladies when demonstrated for different kinds of rhinitis. Nasal alar dilators and saline washings are protected intending to calm nasal blockage; however, a definitive treatment for pregnancy rhinitis still needs to be found [2].

48.2 Causes

The nose and paranasal sinuses are anatomically and physiologically a unified whole, somewhat resembling a bungalow, where there are a number of rooms opening off each other. The meati may be likened to doors connecting the rooms. There is a continuous epithelial lining throughout the nasal interior and adjacent sinuses. An insult to any part of this epithelium usually provokes a response throughout the epithelium. Such insults may arise from a coryzal viral illness, an allergen, such as pet dander, or an irritant substance, such as tobacco fumes. Because these structures are all interconnected, treating rhinitis or nasal discharge may call for consideration of the entire sinonasal unit [3].

Rhinosinusitis of both an allergic and non-allergic type is often worsened by viral pharyngitis or viral infection of the proximal airway if it keeps returning. Such infective episodes can cause bronchitis or asthma, especially where sinusitis is persistent or there is polyposis within the nose. The co-occurrence of asthma, nasal polyposis, and sensitivity to aspirin, the so-called Samter Triad (Samter and Beers), is a familiar situation to clinicians [3]. Chronic rhinosinusitis has a frequent association with hyposmia or anosmia. Sufferers may notice a nasal quality to their voice or have become hoarse. This arises when the resonating sinuses become inflamed or there is inflammation of the vocal cords. Rhinosinusitis is also commonly accompanied by coughing and postnasal drip, as well as strident snoring. Where snoring occurs, this is frequently accompanied by sleep disorder, including, potentially, sleep apnoea. This problem most often occurs in males who are advancing in age and prone to obesity. Bacteria may produce an infection if there is blockage of the meati by oedema or pooling of secretions [3].

In healthy individuals, there is production of mucus to maintain the moisture of the nasal lining. This mucus moves posteriorly towards the pharynx, before being swallowed. Numerous different disorders produce excessive nasal discharge, such as [1]

- *Coryza and influenza*: Mucous build-up may physically obstruct the nose for a particular period.
- *Lacrimation*: Tears pass into the lacrimal ducts, which empty into the nasal interior and pass out as a discharge.

- *Cold weather*: The nose may react to cold temperatures by excessive mucous secretion.
- *Sinusal or adenoidal infections*: Mucus containing trapped pathogens may pool within the sinuses, provoking sinusitis. The adenoids, located within the nasopharynx, are also prone to infections in a child, which may also lead to pooled mucus with entrapped pathogens.
- *Allergic rhinitis*: An allergic reaction to, for example, pollen or animal dander, may provoke excess mucus formation.
- *Non-allergic rhinitis*: The nose may respond to an irritant (e.g. tobacco fumes or polluted air), pungent substances (e.g. spicy food), or a physical stimulus (e.g. cold temperatures) by producing extra mucus.
- *Hypertrophied or oedematous turbinates*: This may result from nasal responses to infection or allergens and may obstruct the nasal passages.
- *Hypertrophied adenoids*: This condition affects children.
- *Polyp formation within the nose*: Polyps grow outwards into the nasal passages. Their shape resembles grapes.
- *Foreign body*: A young child may sometimes insert a foreign body into the nasal cavity, such as a peanut or a bead, which then blocks the nose and produces a malodorous mucous nasal discharge.
- *Nasal cysts or neoplasia*: Although uncommon, unilateral (usually) nasal obstruction may result from a neoplasm (whether benign or malignant) or cyst formation.
- *Choanal atresia or piriform aperture stenosis*: In choanal atresia, the nasopharynx is obstructed from birth onwards. The blockage may be bony or soft tissue type. Bilateral choanal atresia typically presents at birth if bilateral, whereas unilateral atresia may present at a later stage. Stenosis of the piriform aperture is another way in which partial nasal obstruction occurs.
- *Deviation of the nasal septum*: The nasal septum divides the nasal interior into right and left halves. It consists of bony and cartilaginous portions. Where deviation occurs, the side to which the septum bends may obstruct that nasal passage. Cases may be congenital or occur due to trauma later in life.

48.3 History

The history should cover the patient's general state of health. Pyrexia needs to be asked about. Symptoms which exhibit a seasonal pattern may suggest allergic rhinitis, as may pruritus affecting the nose. A personal history of allergic dermatitis or asthma or a family history of atopic disorders points towards allergic rhinitis. If symptoms coincide with stopping a nasal decongestant, this may indicate a drug withdrawal effect.

The length of time for which symptoms are present may also provide clues that help distinguish between a neoplasm, a polyp, or sinusitis. Malodorous discharge points towards a foreign body. A history of facial injury should raise the suspicion of CSF rhinorrhoea. Consider whether symptoms coincide with starting a new drug, such as an oral contraceptive pill or blood pressure controlling agent [4].

48.4 Differential Diagnosis in a Case of Rhinorrhoea

The likely causes can be divided into those conditions featuring inflammation and those that do not. Inflammatory conditions include infections, which may be bacterial or viral, and non-infectious, that is, hay fever, year-round rhinitis (allergic or non-allergic) and non-allergic rhinitis with eosinophilia. Non-inflammatory conditions include vasomotor rhinitis and cerebrospinal fluid leakage [2].

48.4.1 Cerebrospinal Fluid (CSF) Rhinorrhoea

CSF rhinorrhoea is predominantly the result of trauma either through accidental injury or surgery. A mere 3–4% is from other causes [4–9], but where this does occur, diagnosing the cause may be highly complicated.

CSF rhinorrhoea occurs whenever there is a fistulous communication between the dura mater and the base of the skull. As noted above, cases may be traumatic or non-traumatic in origin [10, 11]. Non-traumatic CSF rhinorrhoea affects individuals above the age of 30. It begins slowly and may be mistaken for allergic rhinitis. In non-traumatic CSF rhinorrhoea, hyposmia/anosmia or pneumocephalus is rarely seen. These features are more associated with traumatic cases. Erosive tumours (cholesteatoma, tuberculoma), defective anatomy of the skull base from the time of birth, and meningocele or meningoencephalocele are likely to underlie non-traumatic CSF rhinorrhoea. Head trauma gives rise to around 80% of instances of CSF rhinorrhoea, whilst a further 16% arise from operations that affect the base of the skull [7, 12].

Although CSF rhinorrhoea rarely occurs, it is a condition prone to potentially grave complications, including death. The leakage occurs because the protective barriers interposed between the sinuses, the nose, and the intracranial fossae (anterior and middle) are breached. Because this presents a portal of entry to pathogenic organisms, CSF rhinorrhoea is associated with severe infective complications and possibly catastrophic neurological problems in the future [12].

The composition of CSF includes water, inorganic ions (Na^+, K^+, Mg^{2+}, Ca^{2+}, Cl^-, and HCO_3^-), glucose (at a concentration between 0.6 and 08× blood glucose), amino acids, and a variety of proteins (22–38 mg/dL). CSF is colourless, non-turbid, and usually has no cellular contents. If cells are present, they are polymorphonucleocytes or mononucleocytes (<5/μL) [13].

CSF is mainly (50–80%) produced by the choroid plexus. The remaining volume is produced by the ependyma, which can produce at most 30%, and ultrafiltration from the capillaries, at most 20%, of the total volume. CSF is the final stage of a process whereby plasma is ultrafiltered by the choroidal plexus epithelium, which lines the ventricular spaces of the central nervous system. Sodium ions are actively transported across the epithelial base layer by a Na^+/K^+ATPase channel, which sets up a gradient favourable to water entering the epithelium. HCO_3^- ions are formed by intracellular carbonic anhydrase. An apically located sodium-potassium ion exchange channel then excretes sodium into the ventricular lumen. Water

movement also occurs in the same direction to minimise the osmotic gradient. Thus, CSF forms in the ventricular lumen [13].

Synthesis of CSF is continuous, with formation of around 20 mL hourly, giving a total daily volume produced of around 500 mL. The circulating volume of CSF through the entire CNS is in the range 90–150 mL. The usual pattern of circulation is for CSF to pass from its points of formation within the lateral ventricles, through the cerebral aqueduct into the third ventricle, whence it passes into the fourth ventricle and then through the foramen of Magendie and foramen of Luschka into the subarachnoid space. From the subarachnoid space, reabsorption into the blood occurs at the arachnoid villi [13].

The CSF circulates thanks to a pressure gradient set up between the sites of formation and the arachnoid villi. The usual pressure is between 10 and 15 mmHg. A CSF intracranial pressure exceeding 20 mmHg is considered abnormally elevated [13].

The most suitable pathology test available at present to diagnose CSF in sinonasal discharge is a β2-transferrin assay. However, this test cannot tell the clinician where the fluid is leaking from, nor even from which side. Fluorescein can be used to localise the point where leakage is coming from. For this purpose, fluorescein needs to be injected intrathecally [13].

The optimal technique for diagnosing a defect in the basal skull leading to CSF rhinorrhoea is computed tomography (CT) imaging at high resolution. CT imaging can reveal defects at the base of the skull produced by trauma (in an accident or during surgical procedures), anatomical or developmental anomalies, and destructive lesions affecting the skull base, for example, a tumour [13].

It has been suggested that conservative management is appropriate for instances in which CSF rhinorrhoea begins immediately following an accident since such leakage tends to spontaneously resolve. The approach involves confining the patient to bed for between 7 and 10 days, with the head end raised by around 15–30° [13].

There are a number of possible operative techniques that may be employed to repair CSF leaks arising from the basal skull. In the past, it was common for leakage from the anterior cranial fossa to be approached intracranially, and this technique still finds favour in particular cases. Frontal craniotomy was used to gain access to the anterior fossa [13].

On the other hand, a leak that affects the posterior wall of the frontal sinus can be accessed by a coronal incision and the creation of an osteoplastic flap. Creating this flap allows the clinician to visualise the posterior table of the frontal sinus in its entirety, which is of particular value if the leak occurs at a point higher than 2 cm above the floor and with the lamina papyracea on the medial aspect [13].

Endoscopic repair enjoys a number of advantages over open repair. These include being able to see more of the surgical field, better lighting, and having a magnified view. The scope can also be angled to reach awkward crevices. Using an endoscope, grafts, both under- and overlay types, can be positioned with superior accuracy. Endoscopic repair succeeds in closing defects within the basal skull in 90–95% of cases, as has been repeatedly shown by researchers [14–19].

48.4.1.1 CSF Rhinorrhoea Due to Trauma

Ninety per cent of instances where CSF leakage occurs are produced by penetrating or closed trauma to the skull. If CSF rhinorrhoea starts within 48 h of trauma, this is classified as 'immediate'. If not, it is 'delayed'. The bulk of cases where accidental trauma (e.g. road traffic accident) results in CSF rhinorrhoea are of the immediate type. The majority (95%) of cases of delayed CSF leakage are observed less than 3 months after the initiating trauma occurs [13].

48.4.1.2 Iatrogenic CSF Rhinorrhoea

Unlike CSF rhinorrhoea following accidental trauma, CSF rhinorrhoea secondary to surgical trauma is seen in the first 7 days post-surgery in only half of the cases. Thus, for the majority, CSF rhinorrhoea will only become apparent after returning home from hospital. Accordingly, it is vital that at-risk patients are warned to look out for a salty or metallic taste in their mouth, which might indicate CSF leakage [13].

All types of surgery involving the base of the skull are associated with a risk of iatrogenic injury leading to CSF leakage. Iatrogenic trauma ranges from a straightforward crack in the bone to defects above 1 cm across that may rupture the dura mater and possibly even damage the brain itself [13].

ENT surgical operations, for example, functional endoscopic sinus surgery (FESS) or septoplasty, may damage the integrity of the basal skull and result in CSF rhinorrhoea. There are particular operations used in neurosurgery, for example, craniotomy or transsphenoidal resection of the pituitary, which are frequently found to cause leakage of CSF via the nose [13].

The area most prone to iatrogenic injury during FESS is the lateral lamella of the cribriform plate. This is the point at which the bone forming the base of the skull is at its most slender. The rear fovea ethmoidalis and the rear portion of the frontal recess are also areas where iatrogenic injury is not uncommon [13].

48.4.1.3 CSF Rhinorrhoea Related to a Tumour

Benign neoplasms rarely cause discharge of CSF from the nose. In contrast, tumours that are locally destructive, for example, an inverted papilloma or a malignancy, may cause osteolysis of the anterior cranial fossa. These lesions release enzymes which degrade and lyse the osseous tissues, provoking an inflammatory response and potentially also damaging the dural matter. A tumour may not in itself be responsible for discharge of CSF through the nose. However, when the lesion is excised, immediate-type CSF rhinorrhoea may occur. Surgical planning for such resections needs to encompass how to repair any potential CSF leaks, whether by a transcranial or endoscopic approach [13].

48.4.1.4 Congenital CSF Rhinorrhoea

The anterior neuropore may fail to close completely in early development, resulting in nervous tissue herniating through the anterior cranial fossa. On rare occasions, this gives rise to CSF rhinorrhoea. The usual embryological anomaly is a patent fonticulus frontalis or foramen caecum. The usual presentation of a meningoencephalocoele is as a mass within or exterior of the nose that can be

transilluminated and increases in size when the baby cries, the so-called Furstenberg sign. Any mass which occurs within the nose in a child should provoke suspicion, even more so if the mass is central. Biopsy is absolutely contraindicated before a thorough radiological investigation has been undertaken [13].

48.4.1.5 Spontaneous CSF Rhinorrhoea

CSF discharge through the nose can occur seemingly spontaneously. Calling CSF 'spontaneous' tends to suggest that the real cause is unknown, but in fact it has recently become apparent that spontaneous CSF nasal discharge may be the consequence of raised intracranial pressure (ICP). ICP may become raised for a number of reasons, but, in the case of spontaneous CSF rhinorrhoea, the cause is idiopathic intracranial hypertension. ICP may also become raised if the patient suffers from obstructive sleep apnoea [2].

48.5 Treatment Options

The differential diagnosis of rhinorrhoea can, in the majority of cases, be reached on the sole basis of the patient's account. This dependence on the history has several consequences in terms of how quickly treatment can be initiated and with what degree of efficacy, and to the cost of caring for such patients. In the majority of cases, few investigations will be called for. For example, skin pinprick tests and a full blood count plus nasal smear to test for eosinophilia may be sufficient. Paranasal imaging is not generally indicated if a focus for disease within a particular sinus is not suspected. In such circumstances, the history and physical examination, which reveals pain in a particular area when touched, indicating an air–fluid level, provide the diagnosis. However, it is worth noting that in some cases the history indicates rhinorrhoea or nasal congestion, but with no focus apparent either from the history or examination. Nonetheless, subsequent x-radiography reveals an air–fluid level. Where treatment failure occurs on first-line agents, such as H1-specific antihistamines and intranasal steroid sprays, more intensive and costly investigations may be warranted, that is, CT or MRI studies [2].

If the clinicians think that a bacterial pathogen is also present, the nasal discharge may be sent for laboratory culture. Bacterial superinfection occurs at a late stage in sinusitis, which means antibiotic treatment is not appropriate at the beginning of symptoms. In any case, viral pathogens will be unaffected by antibiotic treatment [2].

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