A possible case of complex regional pain syndrome of the nose?

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Abstract. A possible case of complex regional pain syndrome of the nose? Objective: We present a case report of a patient with a putative diagnosis of complex regional pain syndrome of the nose. We would like to bring this disorder to the attention of rhinologists.

Case report: A 53-year-old man presented with a history of extreme, constant, debilitating pain in his nose that started after he underwent several extensive nasal surgeries. Examination revealed atrophic nasal mucous membranes at the nasal septum. No other abnormalities were found. The pain did not diminish despite administration of analgesics and neuropathic pain medications. We propose a diagnosis of complex regional pain syndrome of the nose.

Conclusion: The large number of nasal surgeries performed worldwide and the far reaching consequences of this debilitating syndrome indicate that it merits further investigation to determine whether it is a distinct disorder that should be recognized as such.

Introduction

Complex regional pain syndrome (CRPS) is a chronic, progressive disorder characterized by a combination of somatosensory, somatomotor and visceromotor symptoms that can include the following: pain, hyperesthesia, hyperalgesia, changes in skin temperature and colour, limited range of movement, muscle spasms, hyperhidrosis, skin, muscle and bone atrophy, pareses, pseudo-paralysis and changes in hair and nail growth. This disorder is generally preceded by a (minor) trauma or surgical procedure, and its precise pathophysiological mechanism is not known.

The International Association for the Study of Pain (IASP) distinguishes between two types of CRPS. CRPS type 1, also named sympathetic reflex dystrophy (SRD), Sudeck’s Atrophy or dystrophy or posttraumatic dystrophy, is thought to be due to increased activity of the sensory nerves as a result of injury or damage to the autonomic nervous system. In the United States, the incidence of CRPS type I is approximately 5 per 100,000 person-years. In CRPS type 2, previously known as causalgia, a lesion to a major nerve is present. The incidence of CRPS is high following crush injury and joint fractures. Relatively few studies have been published regarding CRPS that affects the head and neck area. Here we present a patient with a disproportionate amount of pain in the nose for whom CRPS 1 is a possible diagnosis. To our knowledge, this is the first case report of CRPS type I of the nose. Questions remain, however: Does CRPS of the nose actually exist as a distinct syndrome, and, if it does, can we formulate specific diagnostic criteria to identify it?

Case history

A 53-year-old man was referred to the outpatient clinic of our tertiary centre because of protracted nose pain. Since 1965 he has suffered from frontal headaches on both sides, which prompted two septoplasty procedures (one in 1971 and one in 1975). In retrospect, we think that these headaches should have been classified as chronic tension headaches or chronic daily headaches, since our patient suffered from frequent, moderately severe, pressing bilateral headaches. It is thus difficult to understand the decisions to perform septoplasty.

Despite these surgical procedures – for which a valid indication was clearly lacking – the pain persisted, unchanged. In 1979, this
patient underwent sinus surgery that used a bilateral, external
approach. After surgery in 1979, many ENT physicians and other
specialists were consulted because of the patient’s ongoing, progres-
sive complaints of pain. Our patient suffered chronically from
extremely dry nasal mucous membranes and from a continuous,
bilateral burning and cramping sensation in his nose. The pain
typically increased after exposure to non-specific external stimuli,
such as cold water on his face, air-conditioning, cool air when a door
was opened or a soft breeze. Although he was once an avid
sportsman and physical education teacher, the pain made it impossible
for him to leave his house. During his first visit to our clinic
in 2006, physical examination revealed pus that originated from
a surgical scar in his left eyebrow that had apparently been present
ever since the surgery in 1979. Further inspection of the nose
revealed dry, atrophic nasal mucous membranes at the nasal
septum and a small perforation of the septum. It was clear upon
examination that the patient had undergone sinus surgery. A specif-
ic ENT examination revealed no other abnormalities. Cranial nerve
function was intact.

A CT scan showed the remnant of a drain running from the frontal
sinus towards the scar, but the frontal sinus was otherwise nor-
mally aerated (Figure 1). The drain remnant was removed by re-
opening the old scar. No other pathology was found in the frontal
sinus during this surgical session.

Removing the drain remnant did not afford any pain relief (nor
did we expect it to). The use of various analgesic medications,
including amitriptyline and pregabalin, did not result in any
decrease of the pain. Local anaesthetics were administered on sev-
eral occasions at the sites of the infra- and supratrochlear nerves
and the infra- and supraorbital nerves. Cocainisation of the ante-
rior ethmoidal nerve and the pterygopalatine ganglion were
tried as well, but neither was effective for treating the pain.
Incidentally, for several years now, this patient has been under
the care of a psychiatrist as his life has come to a standstill due to his
debilitating headaches. Given the serious and chronic nature of the
patient’s pain and in the absence of an alternative diagnosis, we
suggest CRPS type 1 of the nose as a diagnosis.

Discussion

The pathophysiology underlying CRPS is still not entirely clear. It
is probable that the sympathetic nervous system plays a large role
in the persistence of pain in CRPS. As a consequence of the
synaptic connections that develop between the sympathetic and the
somatosensory fibres, sympathetic impulses that are caused by a short

![Figure 1](image_url)

CT scan showing A: coronal and B: axial views. Panel A shows
a normal, aerated maxillary sinus and ethmoid sinus. The axial
view in panel B shows a drain running from the frontal sinus
and a normally aerated frontal recess.
circuit may lead to stimulation of the sensory nerves. Three mechanisms are proposed to be involved in CRPS: 1) the peripheral afferent mechanism in which (neuro) inflammation, tissue hypoxia, anatomical changes and acquired immunological and genetic susceptibility play a role; 2) the efferent mechanism, which involves changes to transmitter and receptor sites and includes vasomotor and sudomotor disorders and 3) the 'central mechanism'.

CRPS has three phases, namely an acute phase, a dystrophic phase that occurs approximately 3 months after the initiating trauma and an atrophic phase that occurs after approximately 6 months. These phases are not sharply delineated; rather, the syndrome gradually progresses from one phase to the next. It seems likely that cure or reversal are possible in the acute and dystrophic phases but may be difficult or impossible in the atrophic phase. The development of the disorder may be influenced by the following changes:

1) Sensitization of the nociceptive fibres
2) Cross-activation between damaged or injured afferent fibres
3) Sprouting of the somatic afferent fibres of adjacent intact nerves
4) Activation of afferent fibres by sympathetic efferent nerves
5) Neuroma formation
6) Changes in the central nervous system

There is no gold standard for the diagnosis of CRPS, which is generally made based on medical history and physical examination. The most common symptoms of CRPS type 1 in the head and neck area are pain, hyperalgesia, hyperesthesia and changes in skin temperature and colour. It is particularly striking that the pain in CRPS is not limited to the area of innervation of just one nerve and that the pain is disproportional to the stimulus. Notably, pain may arise spontaneously or can be evoked by certain stimuli. The pain can be experienced as burning pain or as pounding or pressing pain. In this case, the patient was especially bothered by a constant dry and strong burning sensation in his nose. This sensation was felt even when he was breathing just slightly cool air. However, not all patients have all of the classical symptoms, and the symptoms of CRPS may vary. This makes it difficult to diagnose CRPS. The criteria used most commonly to diagnose CRPS type 1 are those proposed by IASP and by Bruehl et al. These criteria give high sensitivity (98%) and average specificity (36%), which may lead to overdiagnosis.

According to the scoring system for CRPS proposed by Gibbons et al., our patient would score three points, which matches the diagnosis “possibly CRPS type 1”. However, we were not able to perform the measurements needed to test for the other Gibbons’ criteria that might have resulted in a higher score. This was partially due to a lack of access to equipment, and also due to the fact that the criteria are not always applicable to every patient.

Based on published studies, we formulated a list of clinical symptoms that, in our opinion, may be helpful for reaching a diagnosis of CRPS of the nose. Our suggested criteria for diagnosing CRPS of the nose are listed in Table I.

A case report by Khoury et al. describes CRPS of the upper jaw after a hemi-maxillectomy. Initially, the diagnosis of CRPS was reached based on symptoms (a burning sensation, erythema and oedema in the affected area), which was later confirmed by the successful treatment that was accomplished by means of a sympathetic nerve block. Moreover, the left half of the face, which was the part that was operated on, was colder than the right half of the face. In this particular case, the autonomic nervous system was most likely involved in the development of these symptoms and complaints. To the best of our knowledge, our case report is the first to describe this disorder for the nose.

### Table I

Possible diagnostic criteria for complex regional pain syndrome type 1 of the nose

<table>
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<tr>
<td>I. Continuous, persistent pain that is disproportionate to the gravity of the experienced trauma.</td>
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<td>II. Pain that is not limited to the area of a single nerve (branch).</td>
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<td>III. Burning pain.</td>
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<td>IV. Hyperesthesia.</td>
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<td>V. Physical examination:</td>
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<td>a) Presence of hyperalgesia and/or allodynia (at light touch).</td>
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<td>VI. No response to medicinal therapy and no decrease in pain after common local anaesthesia</td>
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<td>VII. The absence of any other condition that could explain the severity of the pain and dysfunction.</td>
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CRPS type I of the nose, if it exists as a distinct syndrome, appears to be caused by a combination of afferent and efferent mechanisms. The complaints develop after damage or injury of the sympathetic fibres, which causes disturbed innervation of the blood vessels in the nose and can lead to hypoxia, and vasomotor and/or vaso-sensory disturbances. As a result, the mucosa may become dystrophic or atrophic, and this may play a role in the development of a decreased pain threshold in the nose. Sympathetic cross-activation might also play an important role. This disorder may be caused by otolaryngological surgical procedures such as an external approach to the ethmoidal and frontal sinuses, but it may also be caused by intranasal approaches such as septum surgery, inferior concha reduction and functional endoscopic sinus surgery (FESS).

Due to the preceding (iatrogenic) trauma, it is not easy to clearly distinguish between CRPS type I and Peripheral Neuropathic Pain (PNP), persistent idiopathic facial pain (PIFP) (previously called atypical facial pain, AFP) and/or atrophic rhinitis. However, patients with CRPS type I experience much more intense pain, and their pain threshold is significantly decreased. Simply blowing air softly onto the affected area may cause pain. Moreover, PNP, in contrast to CRPS, can often be treated or influenced medicinally, invasively or by means of a temporary nerve block. PIFP can usually be treated medicinally as well. However, the patient described here did not respond to any kind of treatment. Furthermore, PIFP usually starts on one side of the face in the jaw area; therefore, we might conclude that our patient suffers from an atypical PIFP.

For CRPS patients, sympathetic overactivity is often thought to be...
the underlying cause, and treatment therefore addresses this issue. A (repeated) stellate ganglion block is advised to achieve peripheral blockade of the sympathetic system in the head and neck area.\(^{21-23}\) Notably, the study by Wasner et al.\(^{24}\) provides evidence, by means of thermoregulation (warming and cooling of the entire body), that the reverse is also possible. That particular study showed that the activity of the sympathetic nervous system was decreased in the affected (cold) limb. A sympathetic block can therefore be helpful in distinguishing between sympathetically independent pain (SIP) and sympathetically maintained pain (SMP).

The pathophysiology of atrophic rhinitis may be quite similar to that of CRPS type I. However, due to the intense pain in CRPS type I, we conclude that these are different clinical entities.\(^{25}\)

In light of the large number of nasal surgical procedures and the resulting post-operative pain, we think it is important to propose the possible existence of CRPS type I of the nose as a distinct disorder. Even though there seems to be a relatively low incidence, the incidence may actually be higher than is thought currently based on the actual number of surgeries that are performed. Careful observation has identified two other patients at our clinic whose symptoms would meet the criteria for CRPS type I of the nose listed in Table I. One patient, a 20-year-old female, suffered a crushed nose and orbit at age 10 when she was kicked by a horse. Ever since that incident, she has experienced the sensation of a dry nose and a painful nasal pyramid. Even after the administration of lidocaine, a nasal endoscopy cannot be performed as it would be too painful. The second patient is a 57-year-old woman who suffers from disproportionately intense pain in the nasal area following functional endoscopic sinus surgery. Another reason for a possible diagnosis of CRPS is that this patient has a fairly long history of dystrophy in her extremities.

We realize that our three cases may not be enough to justify a new diagnosis of CRPS type I of the nose, but we sincerely hope that this case report will stimulate a discussion among rhinologists about its possible existence.

Conclusion

CRPS is a complex clinical manifestation that has some typical and some atypical characteristics. Although the disorder predominantly affects the extremities, it can also affect the head and neck area. In view of the large number of surgical nasal procedures performed worldwide, we think that the diagnostic criteria and treatment options for CRPS that affects the head and neck area, and especially the nose, should be investigated further.

References


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Appendix

Autonomic nervous system of the nose

Visceromotor nerve fibres can be divided in sympathetic and parasympathetic fibres. The sympathetic system originates in the spinal cord (segments T1-L2), and the parasympathetic system originates in the brainstem and the sacral part of the spinal cord (S2-S4). The sympathetic system innervates the blood vessels in the nose, and the parasympathetic system innervates the nasal glands. Sympathetic fibres that innervate the nose come from spinal cord segments T1-T3. These preganglionic fibres reach the sympathetic trunk, ascend within the trunk and pass through the stellate ganglion without synapsing. Finally, the preganglionic fibres synapse in the uppermost ganglion, located in the cervical part of the sympathetic trunk (the superior cervical ganglion). Thereafter, the postganglionic fibres continue to their target organs. A large bundle of postganglionic nerve fibres, termed the internal carotid nerve, runs along the internal carotid artery and enters the skull via the carotid canal in the petrous portion of the temporal bone.

Intracranially, a branch of the internal carotid nerve, termed the deep petrosal nerve, joins the greater petrosal nerve, which contains preganglionic parasympathetic fibres and is a branch of the facial nerve. Together they become the nerve of the pterygoid canal (the vidian nerve). This mixed autonomic nerve subsequently reaches the pterygopalatine fossa via the pterygoid canal (see Figure 2). Only parasympathetic fibres synapse in the pterygopalatine ganglion; thereafter, like the postganglionic sympathetic fibres, they join maxillary nerve branches to the nose.

Postganglionic sympathetic fibres also reach the nose along branches of the external carotid artery and probably also via ophthalmic nerve branches that run through the cavernous sinus and the orbit.