



Editorial

Blushing: Past, Present, and Future

Blushing: pasado, presente y futuro

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The autonomic nervous system is divided into sympathetic and parasympathetic parts on the basis of differences in their structures, neurotransmitters, and physiological effects. The sympathetic nervous system innervates mainly the smooth musculature of all structures (blood vessels, lungs, excretory and other visceral organs), the heart, and, in part, the glands (sweat glands, salivary glands, digestive glands). Adipose and liver tissue, kidney tubules, and lymphatic tissue (thymus, spleen, and ganglia) are also innervated by postganglionic sympathetic fibers. The sympathetic nervous system regulates such processes as metabolism, body temperature, skin color, blood flow, defenses, and tissue nutrition.¹

This system may be affected by internal or external factors. As a result, it may lose its regulatory capacity and functional disorders may appear. Symptoms become evident especially in the extremities, although other locations are also affected. The most typical complaints are spontaneous pain and pain with movement, loss of mobility, edema, changes in the skin (texture, temperature, or color), excessive sweating or dryness, and localized osteoporosis.

The craniofacial area and upper limbs are under the control of the cervical sympathetic nervous system. Injuries, fractures, prolonged immobilization, inflammatory processes, or surgery in these areas can irritate nerves and cause eye redness and tearing, balding, vision disorders, headache, edema of the hands, changes in skin color or temperature, excessive sweating (hyperhidrosis), and dry skin. If this irritation continues over a long period, it can lead to considerable damage, including atrophy and loss of function.

Flushing is defined as episodes of erythema of the face, ears, neck, and occasionally the upper chest and epigastric area, caused by a transitory increase in blood flow to these areas. This distribution of flushing is explained by the fact that these areas have a larger number of blood vessels that are more visible because they are located nearer the surface of the skin.² To the best of our current knowledge, the action of the autonomic nervous system and that of circulating vasoactive agents are the 2 mechanisms involved in flushing.^{1,2} The autonomic nervous system regulates both vasodilation and vasoconstriction, although the first is the action that predominates. As autonomic innervation also controls the eccrine

sweat glands, sweating often accompanies flushing caused by autonomic vasodilation. Repeated episodes of flushing eventually lead to rosacea with persistent erythema, telangiectasias (spider veins), and inflammatory changes. As a result of continuous dilation, peripheral vessels, particularly venules and arterioles, become visible on the surface of the skin and stand out against normal skin color. Flushing is sometimes used incorrectly to refer to reddening of the skin from other causes, such as photosensitivity, seborrheic dermatitis, drug-induced rashes, systemic diseases (erythematous lupus, dermatomyositis), hyperthyroidism, or a carcinoid tumor.³ Because a large number of diseases are included in the differential diagnosis of flushing, its possible causes must be determined in order to know when other diseases need to be investigated.

Emotional flushing is referred to as blushing. It is often a normal, though heightened, emotional response in predisposed individuals with fair skin, in whom the blood vessels are easily visible. There may be no obvious trigger. The intensity of blushing can be scored by measuring malar temperature and this score can be used when evaluating treatment options.²

Patients who blush experience frequent, intense episodes of sudden and uncontrollable reddening of the face related to events of daily life or caused by emotional or social stimuli. The most characteristic feature of this syndrome is that it appears instantaneously and is often accompanied by a sensation of agitation, facial heat, tingling, and, occasionally, impaired mental functioning. It usually involves the area from the cheeks to the ears, but can also extend to the neck and the front of the chest. This abnormal tendency to blush in the presence of others increases progressively and is accompanied by feelings of embarrassment and anxiety, producing between episodes a persistent and distressing fear of blushing again. The phenomenon recurs several times in the course of the day for no apparent reason, and fear of blushing may lead to difficulties in communicating with others and to social isolation (social phobia). A vicious circle ensues in which fear increases blushing and blushing increases fear or anxiety. Episodes of blushing thus become longer and more frequent. Facial reddening was described in 1872 by Charles Darwin⁴ as the most peculiar and human of expressions. At the present time, blushing, which has a reported prevalence as high as 10%,^{5,6} is considered one of the cardinal symptoms of social phobia, alongside hyperhidrosis and trembling. Incidence may

vary with geographic location. It appears to be less common in Asia, and a Japanese survey showed that blushing was the indication for sympathectomy in only 16 of 7017 procedures.⁷ However, this may simply reflect the fact that sympathectomy is rarely used for this complaint in Japan, being performed only in isolated cases. In the study by Kao and colleagues⁸ carried out in Taiwan, blushing was observed in only 1 out of every 40 patients presenting palmar hyperhidrosis; our experience, however, has shown that 41% of patients have a family history of facial blushing.

In 1985 Wittmoser⁹ reported the beneficial effect of endoscopic sympathectomy for the first time after operating on 70 patients suffering from blushing over a period of 2 years, with a 95% success rate. The technique did not become widely used, however, until 1998, thanks to the work of the Swedish group at the Borås hospital. The group there published 2 studies with 244 patients suffering from facial blushing.^{10,11} Only 2% were dissatisfied with the results of the operation, 13% were dissatisfied with some side effect, and 85% were totally satisfied. Later studies^{12,13} confirmed those carried out in the 1990s and endoscopic thoracic sympathectomy (ETS) is now a well-established treatment for blushing that is uncontrollable and incapacitating.¹⁴⁻¹⁶

A detailed medical history is essential before opting for surgery. Blushing can be caused by nonemotional phenomena such as facial vasodilation due to exercise or high temperatures, and these should also be taken into account. Postmenopausal flushing is due to a decrease in estrogen concentrations. Certain substances, such as alcohol and some foods, can also trigger blushing. A dermatologist should examine the patient, as diseases such as rosacea may be preceded by a prolonged period of frequent blushing. Other systemic abnormalities, such as carcinoid syndrome and mastocytosis should also be ruled out.

Blushing unrelated to emotions can be concealed by suitable make-up and the use of clothing covering the neck. A reasonable initial treatment approach would involve trying drugs such as β -blockers, anxiolytics, serotonin uptake inhibitors, or other antidepressants, although no conclusive clinical studies demonstrating their effectiveness are available. β -blockers have sometimes reduced blushing, but this effect is largely anecdotal as it has not been studied rigorously. One study, however, observed that these drugs reduced blushing in approximately 75% of patients.¹⁷ Anxiolytics and antidepressants can help reduce the anxiety caused by blushing, but there are no studies showing their effectiveness in decreasing its intensity.

The effect of serotonin uptake inhibitors on social phobia is well documented, but their action on blushing is not.¹⁸ Only 2 studies on the use of botulinum toxin-A for blushing have been published.^{19,20} This treatment provides only temporary improvement and is expensive in the long term; further research is needed to evaluate its efficacy.¹⁶ Several studies have dealt with cognitive behavioral therapy in social phobia patients,²¹⁻²³ but it has been said that it is not possible to draw practical conclusions from these few reports.²⁴ Further research is probably needed on the psychological aspect of blushing and on psychological treatments so that patients can be offered an alternative to surgery.²⁵

Despite the disappointing results of pharmacologic treatments and the contrasting efficacy of sympathectomy for facial blushing, there is no clear indication for surgery in patients with this condition. When the patient perceives various sensations along with blushing, however, sympathectomy is indicated. Such symptoms are facial heat, retrosternal discomfort, or a burning sensation in the affected area.

Patients should be given a detailed explanation of the expected outcomes, side effects, and risks of the operation. It is important to consider that about 10% of patients are not satisfied with the outcome, either because the operation failed to achieve the desired effect or because they developed severe compensatory sweating.¹⁴

This percentage should always be mentioned before deciding for surgery. Finally, it should be noted that reddening of the upper chest and neck does not always respond to sympathectomy¹⁷ and that the operation has little or no effect on reddening produced by heat or the ingestion of alcohol.

The surgical techniques used in sympathectomy for blushing are similar to those used for the treatment of primary hyperhidrosis.²⁶ The application of metal clips to the sympathetic chain²⁷⁻²⁹ is a technique that may allow reversal in the event of incapacitating compensatory sweating; however, reversal is not always possible and there is a risk of developing Horner syndrome due to the elongation of the sympathetic chain when the clip is applied. Furthermore, there is no consensus as to the extent and the level at which sympathectomy should be performed in patients with isolated blushing, although disconnection of the second thoracic (T2) ganglion is necessary.¹² In general, postoperative complications and side effects in sympathectomy for isolated blushing are similar to those observed in sympathectomy for primary hyperhidrosis.³⁰⁻³³

Of the 204 patients on whom we have operated using bilateral ETS for incapacitating blushing over a 7-year period, approximately 25% presented associated social phobia, 10% hyperhidrosis, and 5% spider veins. Our surgical technique consists of the systematic resection of the T2 ganglion of the sympathetic chain using an ultrasonic scalpel. The T3 ganglion may be resected as well, depending on intraoperative skin temperature and pulse wave response. If skin temperature measured at the thenar eminence rises more than 0.5°C or pulse wave amplitude increases more than 5 mm, we do not resect the T3 ganglion.^{34,35}

We have had no deaths and only 1 case of transient Horner syndrome, which occurred at a time when the ultrasonic scalpel was not being used. We had 1 patient who required video-assisted thoracotomy due to pleural symphysis and 5 patients with pneumothorax, only 1 of whom required pleural drainage. Satisfaction has been high. Only 10% of patients felt the operation was insufficiently effective or experienced compensatory sweating following surgery. We have looked at patients in 2 groups, according to whether they have undergone resection of the T2 ganglion only or of both the T2 and T3 ganglia, and found no significant differences between them regarding the effectiveness of the operation or the intensity of postoperative compensatory sweating. Approximately 30% of our patients have been followed for over 2 years, and during this time there has been only a single recurrence. Reoperation was successful in that case.

In summary, before undergoing ETS for uncontrollable facial blushing, the patient should be aware of and accept the consequences of the operation and its possible complications and side effects. The use of new technologies (eg, the harmonic scalpel, clips) for ETS³⁶ and improved surgical techniques—the fruit of accumulated experience—lead us to expect these patients to seek treatment in ever greater numbers.

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