Nose Surgery and the Vomeronasal Organ

José García-Velasco, M.D., F.A.C.S. and Santiago García-Casas, M.D.
México City, México

Abstract. The latest reports on the anatomical and functional characteristics of the vomeronasal organ (VNO) are evaluated. The high incidence of identification of the vomeronasal organ in normal individuals indicates that the vomeronasal system is a universal feature of the adult human nasal cavity. Evaluation of the neuronal connections between this organ and the central nervous system shows that the VNO is a functional chemosensory system with sexually dimorphic specificity and the ability to transduce signals that modulate certain autonomic parameters. The presence of the VNO and its clinical significance must be considered by plastic surgeons during nasal operations.

Key words: Vomeronasal organ—Nasal neurophysiology—Rhinoseptal surgery—Pheromones

Even though the interest in reconstructive rhinoplasty stimulated the development of plastic surgery, it is only in the past few decades that nasal surgery has become one of the most performed procedures. A beautiful and natural-looking nose is one determinant of a satisfactory rhinoplastic result. Of equal importance is a nose that functions normally and well [2–5, 15].

Interest of some investigators in nasal neurophysiology has brought attention to the existence and functionality of the vomeronasal organ (VNO), a rather small anatomical structure located in the nasal mucosa. This sacklike olfactory organ was described in 1703 by the Dutch anatomist Ruysch, by Jacobson in 1811 [7], and in humans by Potiquet in 1891 [4]. The VNO was described in classical French anatomy textbooks [18] as a 2–7-mm-long blind pouch that extends backward into the nasal mucosa of the septum. It opens into the nasal cavity through a small pit located in the anteroinferior area about 2 cm from the nostril at the same level where the septal cartilage meets the bony septum (Fig. 1).

Books on nasal surgery and papers published in specialized journals fail to mention the VNO. For years, the vomeronasal system in humans has been neglected and has commonly been regarded as absent or vestigial in adults. Recently, however, the occurrence of a VNO in adult humans has been shown to be far more common than previously believed. In 1985 both Johnson et al. [8] and Moran et al. [13] found the organ in a large number of subjects studied. Stensaas et al. [16] made a similar observation. In addition,

Correspondence to José García-Velasco, M.D., Hospital Angeles del Pedregal, Camino Santa Teresa No. 1055-502, Col. Heroes de Padierna C.P. 10700, México D.F., México

Fig. 1. Schematic diagram of septal wall. The opening of the vomeronasal organ is on the nasal mucosa at the same level where the septal cartilage meets with the vomer bone, about 2 cm from the nostril.
he examined microscopically 108 serially sectioned human fetal specimens which showed that all had pits leading to prominent vomeronasal organs and nerves connecting the organ to the brain. He concluded that the vomeronasal system is a universal feature of the adult human nasal cavity. Electron microscopy of adult human VNO from fresh cadavers indicated the presence of two potential receptor elements that appear to constitute the components essential for a functional chemosensory system.

We found several studies on the relationship between pheromone detection and the VNO system in animals [10, 19]. Pheromones are chemical messengers secreted externally by an individual and received by a second individual of the same species in which they induce a behavioral reaction [9]. Their effects have been studied extensively in both invertebrate and vertebrate animals [1].

Monti-Bloch and Grosser [11] studied 49 human subjects of both sexes. They recorded the summated receptor potential from the VNO and olfactory epithelium and concluded that the VNO is a functional organ in adult humans and has receptor sites for putative pheromones. Recently, they studied substances they call vomeropherins which are chemosensory substances whose effect is mediated through the vomeronasal organ [12].

The above findings together with data from other electronmicroscopic and neurophysiological studies increased our interest in looking for the VNO in our patients and discovering how difficult it would be for a plastic surgeon to recognize the organ during a routine examination of patients who seek plastic surgery. We were also interested in finding out if, in the process of a rhinoseptal surgery, the VNO can be preserved without changing the aesthetic and functional final results. We dissected five fresh cadavers to evaluate the precise anatomical location of the VNO (Fig. 2). A clinical study of 1000 normal adults of both sexes revealed an identifiable aperture and duct in 91% of the subjects [6].

After completing the clinical study, we routinely searched for the VNO in all of our patients (Fig. 3). We concluded that the VNO is present in all adult humans unless the organ was destroyed in a previous surgery or traumatic event. We also found that the organ can be preserved if, at the time of surgery, special care is taken to observe and preserve the VNO. We found that it is possible to perform a surgical procedure without damaging the septal mucosa, where the VNO is located, as long as the area is dissected carefully.

Discussion

The high incidence of identifying the vomeronasal organ in normal individuals, as reported by several investigators and by us [6, 8, 13, 16], indicates that the vomeronasal system is a universal feature of the adult human nasal cavity. Moran et al. [13] speculated that the special cells found in the vomeronasal system may be chemoreceptors that can play an important role in pheromone detection and reproductive function. Stensaas et al. [16] reported that recent ultrastructural studies revealed an unexpected diversity in the character and distribution of receptor neurons. This collectively supported the notion that there are subsets of receptors with distinctive functional properties (Fig. 4A,B).

Monti-Bloch and Grosser [11], using a double-blind procedure, measured electrical responses of the VNO and the olfactory mucosa by releasing different substances into the nose by means of a noninvasive method. Their results showed that a local response