

# Sexual Dimorphism in the Nose Morphotype in Adult Chilean

Dimorfismo Sexual en el Morfotipo Nasal en Adultos Chilenos

\*Jorge Andrés Troncoso Pazos; \*Iván Claudio Suazo Galdames;  
\*Mario Cantín López & \*\*Daniela Alejandra Zavando Matamala

---

TRONCOSO, P. J. A.; SUAZO, G. I. C., CANTÍN L. M. & ZAVANDO, M. D. A. Sexual dimorphism in the nose morphotype in adult Chilean. *Int. J. Morphol.*, 26(3):537-542, 2008.

**SUMMARY:** The nasal form is one of the most important aspects in assessing the facial aesthetics. Several authors have described changes in the form and nasal dimensions attributable to race and gender. The purpose of this study was to analyze the presence of sexual dimorphism in various morphometric parameters of the nose in a group of Chilean adults. This study involved 180 adults Chilean volunteers, 90 males and 90 females, between the age of 18 and 30 years which were conducted measurements of 12 parameters using indirect anthropometry, based on photographs from the front, profile and the nasal base, standardized, prosecuted through the program Corel Draw Graphics Suite X3. Of the 12 dimensions nasal analyzed, significant differences were found between males and females in 9 of them. These results reinforce the need for analysis of nasal morphotype in our population, because its usefulness in surgery, forensic reconstruction and aesthetics.

**KEY WORDS:** Nose; Sexual dimorphism; Rhinoplasty; Anthropometry; Photogrammetry.

---

## INTRODUCTION

When evaluating the face, one of the things that often call for attention is the set of three facial prominences that characterize the profile: the lips, the nose, and the chin (Pérez, 2004). A great extent of beauty and attractiveness of the face depends on the reciprocal proportion and aesthetic harmony. The set of these three features constitutes the aesthetic facial triad (Canut, 1996).

The nose is one of the main components of the facial aesthetics, and the study of its form is of great importance in plastic surgery (Costa *et al.*, 2005) and forensic facial reconstruction (Rodríguez, 2004; Stephan *et al.*, 2003). The nose can be divided into two parts, one external and one internal or anatomical, where the external is the most studied part (Hochman *et al.*, 2002).

Researchers like Bull (1983), Daniel & Farkas (1988), Aung *et al.* (2000), and Hochman *et al.* described the importance and applications of knowing the nasal forms and their differences in different races, not only for technical purposes, but also for the aesthetic appreciations that are

influenced by the culture (Farkas *et al.*, 1980, 1985, 1986; Leong & White, 2004, 2006).

For years, the use of direct anthropometry was the principle method to describe the different anatomical structures, whereas currently, the most widely used method is the indirect anthropometry (Farkas *et al.*, 1980, 1985, 1986). But researchers like Nechala *et al.* (1999) concluded that there are no significant differences among these methods.

Furnas (1987) described that the standardization of the photographs with a graduated rule next to the patient gave us a real-size or life-size image. Farkas *et al.* (1985) studied the nasal form in Caucasian women, Ofodile & Bokhari (1995) and Porter & Olson (2001, 2003) analyzed the noses of Afro-American men and women, whereas Wu (1992), Aung *et al.* and Leong & White (2004, 2006) described the form and nasal proportions that exist in the Eastern population. Milgrim *et al.* (1996) analyzed the nasal form in Latin women.

\* Department of Normal Anatomy, Faculty of Health Science, Universidad de Talca, Chile.

\*\* Department of Stomatology, Faculty of Health Science, Universidad de Talca, Chile.

In Chile, there were a few studies on the nose; Suazo *et al.* (2007) reported the presence of sexual dimorphism in the soft facial tissue at points related to the nose, in adult Chileans.

The purpose of this study is to analyze the presence of sexual dimorphism in different morphometric parameters of the nose in a group of adult Chileans.

## SUBJECT AND METHOD

In this study, about 180 Chilean adult volunteers participated, comprising of 90 males and 90 females, between the age of 18 and 30 years. Prior to the study, all the volunteers were examined for scars or facial deformities, by performing a brief anamnesis, which determined the history of surgery or facial trauma. All participants declared to have at least three generations of Chilean ancestry.

Using a digital camera Cyber-shot Sony 7.2 megapixel, photographs of the frontal, profile, and the nasal base plane were taken. For the frontal and profile photographs, the patients were seated in such a way that the head aligns parallel to the floor, with respect to the Frankfort plane, which could be verified by means of a rectangular square, located in the latter part of the patient, the photographic center was located at 70 cm of the pronasal point (Hochman *et al.*).

To obtain a vision of the nasal base, the patient was positioned with the neck in extension, so that the pronasal and glabella points were in the same plane, verified with the square, with the objective of the camera located at 45 cm from the nasal apex (Hochman *et al.*). All the photographs were taken on a blue background and digitized in JPEG format (Hochman *et al.*; Leong & White, 2004, 2006). Later, the images were processed using the program Corel Draw Graphics Suite X3 that could reproduce the image in real-size or life-size dimensions, on which the points were identified and marked, which helped in making the following measurements.

1. Distance between endocanthion points (EN-EN): It describes the distance between endocanthion left and right points in a patient's front image (Fig. 1).
2. Nasal bony base width (BB): It corresponds to the width between the nasal bones of the left and right sides (Fig. 1).
3. Interalar distance (AL-AL): It corresponds to the distance between left and right alar points, which corresponds to the nasal wing contour point in the most convex area (Fig. 1).

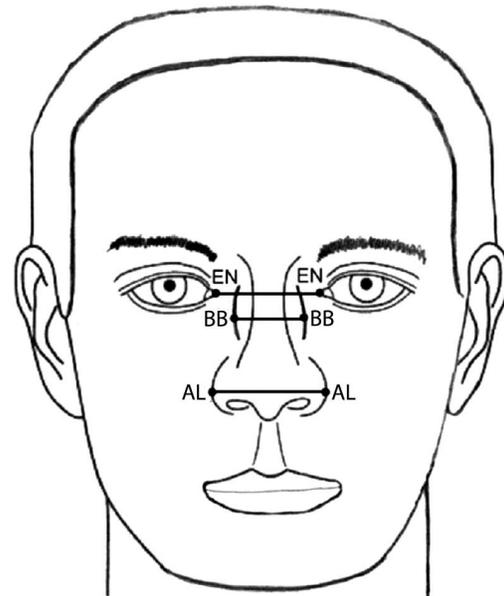


Fig. 1. Outline of the measurements made in the frontal images of 180 males and females between 18 and 30 years. EN-EN: Intercantal distance; BB: nasal bony base width; AL-AL: interalar distance.

4. Bialar base distance (AL-AL Base): It corresponds to the distance between both the nasal wings in a patient's basal image (Fig. 2).

5. Nasal base to pronasal distance ([AC-AC]-PRN): It corresponds to the distance that extends from the union of both alar curvature points to the pronasal point in a basal image (Fig. 2).

6. Bialar angle (BAA): It corresponds to the angle formed by both nasal wings in the basal image of the nose (Fig. 2).

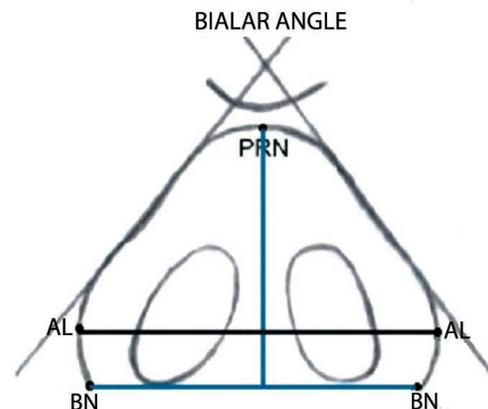


Fig. 2. Outline of the measurements made in the basal vision of the nose of 180 males and females between 18 and 30 years. In gray, bialar angle; blue, nasal base to pronasal distance; in black, bialar base distance.

7. Naso-frontal Angle (NFR): It corresponds to the angle whose vertex is the nasion and comprising of a tangent line to the frontal bone in the frontal prominence and another tangent line to the nose. It is measured in degrees on the profile image of the patient (Fig. 3).

8. Naso-labial Angle (NLA): It corresponds to the angle whose vertex is the subnasal point, lying in a tangent line to the nasal tip and another tangent line to the upper lip (Fig. 3).

9. Nasal wing to pronasal distance (AL-PRN): It corresponds to the distance from the nasal wing in the most convex area to the nasal tip on the patient's lateral image. It allows locating the nasal tip with respect to the nasal wing (Fig. 3).

10. Nasal length, nasion-pronasal distance (N-PRN): It corresponds to the length of the nasal dorsa that extends from nasion to pronasal point. It is analyzed from a lateral image and measured in mm (Fig. 3).

11. Nasion projection: It corresponds to the distance that lies in the nasion of the orbital cavity in a lateral view since the birth, that is, it is measured from a perpendicular spot at the highest and medial point of the upper orbital rim to the nasion in a profile image (Fig. 3).

12. We also calculated the nasal basal index ( $[(AC-AC)-PRN/AL-AL \text{ base} / 100]$ ), which corresponds to the relationship between the basal width and height.

Results were analyzed using the program SPSS 11.5 for Windows, with which descriptive statistics were obtained from the sample; the statistical significance of mean differences between the gender nasal dimensions was determined by applying the t-test with significance levels of 95% and 99%.

## RESULTS

The nasal dimensions of 180 males and females were analyzed by means of indirect anthropometry, using frontal, profile, and nasal base photographs. The measurements and results are summarized in Table I.

**Distance between endocanthion points (EN-EN).** The results obtained with respect to the distance between left and right endocanthion showed that the Chilean female population in the Maule's region exhibited a mean intercantal distance of 30.3 mm (minimum 21.8 mm and maximum 39.6 mm), while the male population of the same region had a mean distance of 30.28 mm (minimum 22.6 mm and

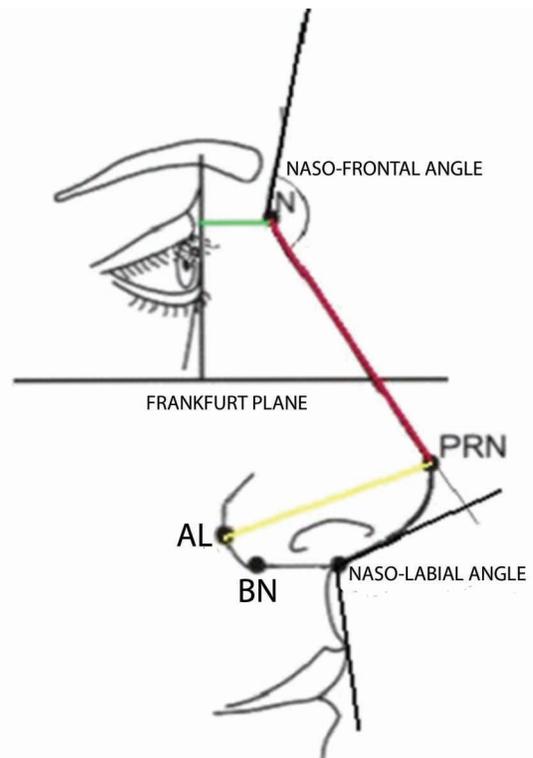


Fig. 3. Outline of the measurements made in the basal vision of the nose of 180 males and females between 18 and 30 years. In green: nasion projection; red: nasal length (N-PRN); yellow: nasal wing to pronasal distance (AL-PRN); nasolabial and nasofrontal angles in black.

maximum 41.9 mm), with  $p < 0.05$ , establishing no significant differences between both genders.

**Nasal bony base width.** According to the nasal bony base width, it was determined that the female population had a mean of 19.24 mm (minimum 15.2 mm and maximum 25.2 mm), while the mean of the male population was 20.0 mm (minimum 14.6 mm and maximum 26.9 mm), with  $p < 0.05$  and showed that there is no significant difference between both genders.

**Interalar distance.** The female population presented a mean interalar distance of 35.17 mm (maximum 25.5 mm and minimum 53.6 mm), while for the male population it was 37.34 mm (maximum 28.9 mm and minimum 50.3 mm). On analyzing the data ( $p < 0.01$ ), we found that there are significant differences between both genders, with the male population showing a larger interalar distance than the female group.

**Bialar base distance.** The female population in the Maule's region presented a mean bialar base distance of 53.05 mm, while the male population had a mean of 57.35 mm. In analyzing the results with  $p < 0.01$ , we inferred that there are significant differences between the two genders, where the

Table I. Comparison table of the values obtained from measurements in 12 nasal dimensions in 180 males and females between 18 and 30 years.

	Gender	N	Mean	S D	M E	Sig.(bilateral)
<b>Distance EN -EN</b>	Male	90	30.3	5.0371	0.531	
	Female	90	30.3	4.3664	0.460	0.984 (P<0.05)
<b>Nasal bony base width</b>	Male	90	20.0	3.2152	0.338	
	Female	90	19.2	3.1668	0.333	0.110 (P<0.05)
<b>Interalar distance</b>	Male	90	37.3	5.0499	0.532	
	Female	90	35.17	5.5420	0.584	0.007 (P< 0.01)
<b>Bialar base distance</b>	Male	90	57.35	8.6807	0.915	
	Female	90	53.05	8.1527	0.859	0.001(P<0.01)
<b>Nasal base to PRN distance</b>	Male	90	43.51	6.9803	0.735	
	Female	90	39.23	6.5648	0.692	0.000 (P<0.01)
<b>Nasal basal index</b>	Male	90	76	7.220	0.761	
	Female	90	74	6.3551	0.669	0.039(P<0.05)
<b>Bialar angle</b>	Male	90	67.84	11.137	1.174	
	Female	90	68.62	9.075	0.957	0.608 (P<0.05)
<b>Naso-frontal angle</b>	Male	90	137.61	7.143	0.753	
	Female	90	143.19	5.401	0.569	0.000(P<0.01)
<b>Naso-labial angle</b>	Male	90	104.8	10.530	1.110	
	Female	90	109.9	9.699	1.022	0.001 (P<0.01)
<b>Nasal wing to PRN distance</b>	Male	90	32.6	4.1086	0.433	
	Female	90	28.61	3.9336	0.414	0.000 (P<0.01)
<b>Nasal length</b>	Male	90	50.09	5.878	0.620	
	Female	90	46.86	6.619	0.698	0.001 (P<0.01)
<b>Nasion projection</b>	Male	90	9.2	2.1143	0.222	
	Female	90	7.73	1.9927	0.210	0.000 (P<0.01)

male population showed a higher bialar base distance than the female population.

**Nasal base to pronasal distance.** The distance from the nasal base to pronasal present in the analyzed female and male population showed a mean of 39.23 and 43.51 mm, respectively. On analyzing these results (p<0.01), we were able to determine that there are significant differences between both genders, the male population presenting a greater mean distance from the nasal wing base to pronasal than the female population.

**Bialar angle.** The bialar angle obtained in a basal image of the nose showed a mean of 68.62° in the female population (minimum 50° and maximum 86°). On the other hand, the bialar angle mean in the male population was 67.84° (minimum 36° and maximum 89°), showing no significant differences between both genders (p<0.05).

**Naso-frontal angle.** The naso-frontal angle in the female population tested had a mean of 143.19° (minimum 128° and

maximum 155°), whereas the male population had a mean of 137.61° (minimum 118° and maximum 152°). From these results, it was possible to infer that the female population had a more obtuse naso-frontal angle than the male population, with significant differences between both genders (p<0.01).

**Naso-labial angle.** We found that the naso-labial angle in the female population had an angulation mean of 109.9° (minimum 82° and maximum 127°), while the male counterparts had a mean of 104.8° (minimum 76° and maximum 130°). From these results, we can say that the naso-labial angle was more acute in the male population, while it was more obtuse in the female population, with significant differences between both the genders (p<0.01).

**Nasal wing to pronasal distance.** It corresponds to the distance from the most convex point of the nasal wing to the nasal tip (PRN) obtained from the individual profile image. The female group showed a mean distance of 28.61 mm (minimum 22.3 mm and maximum 38.7 mm), while the male population showed a mean of 32.6 mm (minimum 24.8 mm

and maximum 42.6 mm). There were significant differences in the location of the pronasal point from the nasal wing on an individual profile image ( $p < 0.01$ ), with the male population exhibiting the most anterior location from the nasal wing than the female population.

**Nasion projection.** The female and the male populations had a mean of 7.73 mm (minimum 2.6 mm and maximum 12.3 mm) and 9.20 mm (minimum 4.3 mm and maximum 12.9 mm), respectively. There were a significant differences ( $p < 0.01$ ) in the nasion projection from the face between the two genders, the male having a greater projection than the female population.

**Nasal length.** The female population had a mean nasal length of 46.86 mm (minimum 34.6 mm and maximum 69.2 mm), while the male population had a mean of 50.09 mm (minimum 40.1 mm and maximum 63.2 mm). On analyzing the results, we found that there were significant differences ( $p < 0.01$ ) with respect to the nasal length between female and male, the male having a nasal length greater than the female population.

**Nasal basal index.** The nasal basal index corresponds to the basal relationship of the nose between the bialar width and the basal height. The female population had a mean nasal basal index of 0.74/100, whereas the male population had a mean of 0.76/100. We observed significant differences ( $p < 0.05$ ) between both genders, the male population having a stronger link than the female population.

## DISCUSSION

One of the most variable structures of the face is the nose. Researchers like Farkas *et al.* (1980, 1985, 1986), Leong & White (2002, 2004), Porter & Olson (2001, 2003), and others studied and inferred the various differences in the structure of the nose, attributable to race, age and sex.

In our study, we used photogrammetry to determine the size of the nasal dimensions. In his research, Ward (1979)

concluded that there is no difference between the measurements obtained from photographs and those directly obtained from the patient, supporting the works of Farkas *et al.* (1980), who conducted a validation study of photogrammetry, determining that the frontal, profile, and baseline projections were necessary for analyzing the nasal morphotype.

In this study, 12 nasal dimensions were analyzed, in which significant differences were found in 9, most of the values being higher in males, with the exception of the naso-frontal and naso-labial angles that were higher in females, and these results were similar to those encountered by various studies in different ethnic groups (Leong & White, 2004, 2006; Porter & Olson, 2003; Milgrim *et al.*; Aung *et al.*), which reinforce the need to understand the differences in the shape and nasal dimensions in males and females.

The studies of Farkas *et al.* (1986) on the Caucasians, Ofodile & Bokhari on Blacks, and Aung *et al.* on Eastern population showed that there is a sexual dimorphism with respect to nasal morphotype.

The data obtained in this study are useful in surgery, orthopedics, and cosmetics planning. According to Bull and Daniel & Farkas, often patients who undergo nasal surgery do not prefer a perfect nose like that of Caucasians conons described in the renaissance (Leong & White, 2006), but opt for a shape harmonious and with the characteristics of the population to which the individual belongs. This is how the aesthetic concept, often subjective with the goal, comes into light with that of the ethnic and gender variations experienced by nasal morphotype.

For forensic identification, facial approximation is more accurate when tissue thickness tables and external anatomical parameters like the nose, lips, and ears of our population are known. Stephan *et al.* described the importance of the projection of the nasal tip in the identification and forensic facial reconstruction, which was found to be more accurate if the racial nasal morphotype of the individual to be identified is known.

---

TRONCOSO, P. J. A.; SUAZO, G. I. C., CANTÍN L. M. & ZAVANDO, M. D. A. Dimorfismo sexual en el morfotipo nasal en adultos chilenos. *Int. J. Morphol.*, 26(3):537-542, 2008.

**RESUMEN:** La forma nasal es uno de los aspectos más importantes al evaluar la estética facial. Diversos autores han descrito variaciones en la forma y dimensiones nasales atribuibles a raza y género. El propósito de este estudio fue analizar la presencia de dimorfismo sexual en distintos parámetros morfométricos de la nariz en un grupo de adultos chilenos. En este estudio participaron 180 adultos chilenos voluntarios, 90 hombres y 90 mujeres, de entre 18 y 30 años, a los cuales se les realizaron mediciones de 12 parámetros, utilizando antropometría indirecta a partir de fotografías de frente, perfil y de base nasal, estandarizadas, procesadas mediante el programa Corel Draw Graphics Suite X3. De las 12 dimensiones nasales analizadas, se encontraron diferencias significativas entre hombres y mujeres en 9 de ellas. Estos resultados refuerzan la necesidad de realizar análisis del morfotipo nasal en nuestra población, por su utilidad en cirugía, reconstrucción forense y estética.

**PALABRAS CLAVE:** Nariz; Dimorfismo sexual; Rinoplastía; Antropometría; Fotogrametría.

---

## REFERENCES

- Aung, S. C.; Foo, C. L. & Lee, S. T. Three dimensional laser scan assessment of the Oriental nose with a new classification of Oriental nasal types. *Br. J. Plast. Surg.*, 53(2):109-16, 2000.
- Bull, T. R. Rhinoplasty: aesthetics, ethics and airway. *J. Laryngol. Otol.*, 97(10):901-16, 1983.
- Canut, J. Un análisis estético dentofacial. *Rev. Esp. Ortod.*, 26:13-30, 1996.
- Costa, J. R.; Prates, J. C.; De Castilho, H. T. & Santos, R. A. Estudio craneométrico de los huesos nasales y proceso frontal de la maxila. *Int. J. Morphol.*, 23(1):9-12: 2005.
- Daniel, R. K. & Farkas, L. G. Rhinoplasty: image and reality. *Clin. Plast. Surg.*, 15(1):1-10, 1988.
- Farkas, L. G.; Bryson, W. & Klotz, J. Is photogrammetry of the face reliable? *Plast. Reconstr. Surg.*, 66(3):346-55, 1980.
- Farkas, L. G.; Hreczko, T. A.; Kolar, J. C. & Munro, I. R. Vertical and horizontal proportions of the face in young adult North American Caucasians: revision of neoclassical canons. *Plast. Reconstr. Surg.*, 75(3):328-38, 1985.
- Farkas, L. G.; Kolar, J. C. & Munro, I. R. Geography of the nose: a morphometric study. *Aesthetic Plast. Surg.*, 10(4):191-223, 1986.
- Furnas, D. W. Precision nasal profileplasty with life-sized slide projections, calibrated xerograms, and intraoperative measurements. *Clin. Plast. Surg.*, 14(4):631-7, 1987.
- Hochman, B.; Castilho, H. T. & Ferreira, L. M. Padronização fotográfica e morfométrica na fotogrametria computadorizada do nariz. *Acta cir. bras.*, 17(4):258-66, 2002.
- Leong, S. C. & White, P. S. A comparison of aesthetic proportions between the Oriental and Caucasian nose. *Clin. Otolaryngol. Allied. Sci.*, 29(6):672-6, 2004.
- Leong, S. C. & White, P. S. A comparison of aesthetic proportions between the healthy Caucasian nose and the aesthetic ideal. *J. Plast. Reconstr. Aesthet. Surg.*, 59(3):248-52, 2006.
- Milgrim, L. M.; Lawson, W. & Cohen, A. F. Anthropometric analysis of the female Latino nose. Revised aesthetic concepts and their surgical implications. *Arch. Otolaryngol. Head Neck Surg.*, 122(10):1079-86, 1996.
- Nechala, P.; Mahoney, J. & Farkas, L. G. Digital two-dimensional photogrammetry: a comparison of three techniques of obtaining digital photographs. *Plast. Reconstr. Surg.*, 103(7):1819-25, 1999.
- Ofofodile, F. A. & Bokhari, F. The African-American nose: Part II. *Ann. Plast. Surg.*, 34(2):123-9, 1995.
- Pérez, D. A. S. *Influencia de la prominencia facial en la apreciación estética del perfil facial*. Tesis para optar al Título de Cirujano Dentista. Universidad de Talca, Chile, 2004.
- Porter, J. P. & Olson, K. L. Analysis of the African American female nose. *Plast. Reconstr. Surg.*, 111(2):620-6; discussion 627-8, 2003.
- Porter, J. P. & Olson, K. L. Anthropometric facial analysis of the African American woman. *Arch. Facial Plast. Surg.*, 3(3):191-7, 2001.
- Rodríguez, C. J. V. *La Antropología Forense en la identificación humana*. Bogotá, Universidad nacional de Colombia, 2004. pp.185-214.
- Suazo, G. I. C.; Salgado, A. G. E. & Cantín, L. M. G. Evaluación ultrasonográfica del tejido blando facial en adultos chilenos. *Int. J. Morphol.*, 25(3):643-8, 2007.
- Stephan, C. N.; Henneberg, M. & Sampson, W. Predicting nose projection and pronasale position in facial approximation: a test of published methods and proposal of new guidelines. *Am. J. Phys. Anthropol.*, 122(3):240-50, 2003.
- Ward, C. M. An analysis, from photographs, of the results of four approaches to elongating the columella after repair of bilateral cleft lip. *Plast. Reconstr. Surg.*, 64(1):68-75, 1979.
- Wu, W. T. The Oriental nose: an anatomical basis for surgery. *Ann. Acad. Med. Singapore.*, 21(2):176-89, 1992.

Correspondence to:  
Prof. Dr. Iván Suazo Galdames  
Department of Normal Anatomy  
Lircay street s/n Office N°104  
Universidad de Talca  
Talca  
CHILE

Phone 56-71-201682  
Fax 56-71-201452

Email: [isuazo@utalca.cl](mailto:isuazo@utalca.cl)

Received: 10-03-2008

Accepted: 23-06-2008