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## Treatment for Gynaecomastia in Men. Experience with the Inferior Periareolar Incision in a Single Third Level Medical Facility

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### Authors' contributions

This work was carried out in collaboration between all authors. Authors ÁMJ and ÁEA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MGC, CMP and AÁD managed the analyses of the study. Authors RGBH, AGG and EGC managed the literature searches. All authors have read and approved the final manuscript.

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### ABSTRACT

**Background:** Gynaecomastia is defined as an enlargement of the mammary gland in men.

**Objective:** To evaluate Aesthetic Results of Subdermal Mastectomy by means of Inferior Periareolar Incision.

**Materials and Methods:** Descriptive, cross sectional and prospective study. We evaluate aesthetic results of Subdermal Mastectomy by means of Inferior Periareolar Incision using Analog visual Scale applied by an another Surgeon) and a Questionnaire (Auto Evaluation). Variables: Age, Clinical Symptoms, Evolution time, Complications and Aesthetic Results. Descriptive and Inferencial Statistic was used (Wilcoxon test).

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**Results:** Twelve patients, median age 27.5 (18-58) year-old. Nine (75%) patients presented pain, 4 (33.3%) bilateral gynaecomastia, 4 (33.3%) left and 4 (33.3%) right sided gynaecomastia. According to Simon Classification, 3 (25%) patients grade I; 2 (16.6%) IIa; 2 (16.6%) IIb and 5 (41.6%) III. No patient presented concomitant disease, 12 (100%) had normal secondary sexual characteristics. Six (50%) had hyperesthesia. The Aesthetic Evaluation made by a distinct Surgeon was as it follows, 10 (83.3%) had a  $\leq 6$  punctuation and 2 (16.6%) had  $\geq$  seven (0 - 10, Analogue Visual Scale). Ranks for Aesthetic Aspect Evaluation made by the patients, before and after surgery were 2.54 (average after surgery) and 0.00 (average before surgery),  $Z = -1.857$ ,  $p = 0.0063$  ( $p < 0.05$ , Wilcoxon).

**Conclusion:** Subdermal Mastectomy should be in lower case by Inferior Periareolar Incision, it does not present severe complications however aesthetic results are undesirable.

*Keywords: Results; periareolar incision; mastectomy; gynaecomastia.*

## 1. INTRODUCTION

Gynaecomastia is defined as an enlargement of the mammary gland in the male gender, the most common mammal pathology. It is characterized by a firm, elastic, rubbery, painful mass located behind the mammary areola, which can be transient or durable and potentially being able to cause behavioral disturbances.

The term gynecomastia comes from the greek: gyne, female; mastos, breast [1,2]. Even though the term gynecomastia literally means breast of a woman, it is used to designate the benign enlargement of the size of the mammary gland in the male gender [3]. It can affect about one to two-thirds of the teenage male population. In most cases, it is not considered an illness [2,3].

It can be produced by a plasmatic or intramammary imbalance of estrogen-testosterone as well as an alteration at any level of the hypothalamic-pituitary-testicular axis [4]. It disappears after 12 to 14 months of duration, persisting only in 8% of cases after three years of evolution [2,5-6].

Gynecomastia is considered a pathology, when the etiology is known or when it is associated to anomalies such as, renal or hepatic insufficiency, hyper or hypo thyroidism, neoplastic diseases, obesity, testosterone deficiency, anorchidia, Klinefelter's Syndrome, chronic testicular disease, prolactinomas, defects in testosterone synthesis, incomplete insensitivity to androgens or Reifenstein's Syndrome [2].

Gynaecomastia in the neonate occurs in up to 60%, is self-limited and can resolve spontaneously in few weeks or months. At puberty up to 70% can disappear in a one year period [2,5-6].

Ley et al. [2] observed gynaecomastia in up to 40% of studied cases. Generally is bilateral, although up to 20% are unilateral. Most of the times, the patient seeks medical attention for the psychological impact or the pain by the augmentation of the volume which leads to a concealment behavior. A detailed study should be performed in each patient to discard malignancy or concomitant diseases [3].

A clinical classification introduced by Simon describes gynaecomastia as follows: Grade I, little visible breast augmentation without redundant skin; grade II A, moderate breast augmentation without redundant skin; grade II B, moderate breast augmentation with redundant skin and grade III severe breast augmentation with redundant skin which predominates in obese patients.

The medical therapy is used in patients with a predominance of gynaecomastia for more than two months or in those with social or emotional condition [3]. Clomiphene, Danazol and Tamoxifen have been used for periods of one to three months. However, Tamoxifen has shown efficacy and fewer side effects, can achieve remission of gynaecomastia and can help to avoid surgical treatment and pain in a 83.3% and 84% respectively.

When gynaecomastia persists for more than one year, the fibrotic tissue with hyalinization and minimal ductal proliferation becomes predominant. This condition does not permit involution to occur, therefore, surgery should be performed as a choice treatment [6-7].

Actually, surgical excision of the mammary gland is the most widely used therapy, which is carried out through a transareolar or periareolar access, considering the diameter of the patient's areola (ranging from 2 to 4, 2.8 average cm). In patients with prominent fatty component, the liposuction complements the treatment, improving the pectoral region contour. Good results are reached with excisional techniques, however, these are not exempt of complications [1,8-10].

Courtiss reported a high percentage of complications in 192 surgeries performed to 101 patients. Within these, overcorrection (18.7%), disfiguring scar (18.7%), hematoma (16.1%), seroma (9.4%) and undercorrection (21.9%) are included [6,11-12].

The surgical technique to perform, subdermal mastectomy, depends on the degree of gynaecomastia. The purpose of all procedures is subdermal excision of the mammary gland and redundant tissue [13]. This procedure can be carried out by several incisions; among these we have the inferior, superior and external periareolar, periareolar with bilateral extensions, transareolar, on the mid-axillary line and underarm. The incision length varies according to the size of the gynaecomastia and the ability of the surgeon [1,11,14].

When reviewing the medical literature in Pub Med and Cochrane, a work whose main objective was the evaluation of the aesthetic aspects of subdermal mastectomy was not found. The objective of this paper is to present the experience in treatment for gynaecomastia in the male gender in a Single Third Level Medical Facility.

## **2. MATERIALS AND METHODS**

Cohort study held at a Third Level Medical Facility in Puebla, Mexico, during the period January 2010 to December 2012. This research protocol was submitted for evaluation and approved by the Local Committee for Health Research of the Hospital. Male patients with gynaecomastia to whom a subdermal mastectomy through an inferior periareolar incision was performed and accept to participate, were included by filling out an informed consent.

**Surgical Technique:** A crescent moon-shape like incision was used immediately below the areolar inferior flange without any prolongations (inferior periareolar incision). The gland dissection and hemostasis were done by using electrocautery. To avoid the formation of a liquid collection, Drenovac type drainage was placed and externalized by counter opening, in

a 2cm distant place from the incision. The wound closure was performed by approximation of deep planes with vicryl and skin sutured with nylon.

The variables set for this study were: age, clinical features, complications and aesthetic surgical results. The aesthetic results evaluation was performed by a surgeon who did not realized the procedure and carried out through a visual analog scale (VAS), with ranges from 0 to 10 applied one year after the procedure.

Reviewing the world medical literature in Pub Med and Cochrane we did not found articles in which the principal objective was the aesthetic evaluation of the periareolar inferior incision for the treatment of gynaecomastia in men. Therefore, we decided to perform it through the application of the visual analogue scale and a questionnaire.

The visual analogue scales, are widely used and have previously been used for the assessment of other types of incisions [1]. To avoid bias in the application of the visual analogue scale, we invited a different surgeon from the one who performed the surgery; he applied the scale six months after the procedure to avoid any changes associated with wound healing. However, the results are unsatisfactory, since a large percentage (83.3%) of the patients had an equal result or lower than 6 in the visual analogue scale which ranges from 0 to 10.

The evaluation made by the patients themselves was by filling out a six items questionnaire, which was validated before its application by three experts, a clinical researcher, a surgeon and a family physician (Table 1). The first five items evaluate aesthetic aspects of the procedure itself and the sixth item the global aesthetic aspect.

**Table 1. Questionnaire used to evaluate the aesthetic result**

<b>Questionnaire assessment of aesthetic outcome perceived by patients after subdermal mastectomy with an inferior periareolar incision.</b>										
<b>1.- Are you happy with the type of scar that was made for your surgery?</b>										
Very unhappy 0	1	2	3	4	5	6	7	8	9	Very happy 10
<b>2.- Are you happy with the scar length?</b>										
Very unhappy 0	1	2	3	4	5	6	7	8	9	Very happy 10
<b>3.- From an aesthetic point of view. Would you recommend this operation to a colleague who had to extirpate the mammary gland?</b>										
Yes	no									
<b>4.- What result would you consider more important, the aesthetic or the resection of the gland (functional) ?</b>										
Aesthetic	Functional	Indifferent								
<b>5.- Si se pudiera quitar su glándula mamaria, por una herida del mismo tamaño, pero lejos de su pezón ¿preferiría que lo hubiéramos realizado así?</b>										
Yes	No	Indifferent								
<b>6.- Assessing the appearance of the affected area, in this moment. What grade would you give to the appearance of the affected area? (Global aesthetic appearance)</b>										
Very bad 0	1	2	3	4	5	6	7	8	9	Excelent 10

The questionnaire was applied as follows: the first five items were applied one year after the procedure and the sixth item before and one year after the procedure. The aesthetic result was evaluated by the patient by comparing the appearance of the pectoral region before and after surgery.

Reliability for the Questionary was 0.7 (Chronbach´s Alfa for the six items) and results were presented by means of descriptive statistics and aesthetic results before and after surgery by using Wilcoxon test on the SPSS v.22 program.

### 3. RESULTS

Twelve patients participated in the study, the median age was 27.5 (18-58) years old. Nine (75%) presented pain, 12 (100%) had rubbery consistency of the resected mammary gland, 4 (33.3%) of the patients presented bilateral gynaecomastia, 4 (33%) in left side and 4 (33.3%) in the right side. According to The Simon Classification 3 patients (25%) were grade I; 2 (16.6%) grade IIa; 2 (16.6%) grade IIb and 5 (41.6%) grade III. All of the patients had normal sexual features and none had associated diseases. (Table 2)

After the surgery 6 (50%) patients showed decreased sensitivity of the areola on the operated side.

**Table 2. Clinical characteristics of the patients with gynaecomastia undergoing subdermal mastectomy by an inferior periareolar incision**

Clinical characteristics of the patients		n	%
<b>Mean age 27.5, minimum 18 – maximum 58 years old</b>			
Pain		9	75
Rubbery consistency of the resected gland		12	100
Affected side	Bilateral	4	33
	Left	4	33
	Right	4	33
Grade Simon	I	3	25
	IIa	2	16.6
	IIb	2	16.6
	III	5	41.6
Associated diseases	None	0	100
Secondary Sexual Characteristics	Normal	12	100

*n= number of patients, %= percentage*

The visual analog scale results (six months after the surgery) applied by a different surgeon were as follows: 1 (8.3%) patient gave 4 points, 5 (41.6%) patients 5 points, 4 (33.3%) patients 6 points, 2 (16.6%) patients 7 points (Table 3).

When we applied the first five items of the aesthetic aspect of the evaluation questionnaire to each patient after six months of the surgery, the following results were obtained: regarding the type of scar, 7 (58.3%) of the patients had greater than 6 on a scale from 0 to 10, regarding the scar length all of the patients had a response greater than 7 on a scale from 0 to 10, none of the patients recommend the type of incision used in the surgery, regarding the importance of the functional or aesthetic value 11 (91.6%) of the patients gave importance to the aesthetic value and 1 (8.3%) patient responded indifference. All of the patients would recommend an incision of equal size but away from the nipple (Table 4).

**Table 3. Aesthetic perception of the mammary affected region, performed a year after the surgery by a different surgeon, Visual-analog scale, from 0 (minimum) to 10 (maximum)**

<b>Aesthetic evaluation made by a distinct surgeon (VAS) n=12</b>	
<b>Patient</b>	<b>Evaluation</b>
1	7
2	6
3	7
4	5
5	6
6	5
7	4
8	5
9	6
10	5
11	5
12	6

*n= number of patients, VAS=visual analogue scale*

**Table 4. Results of the questionnaire of the aesthetic evaluation applied to all patients, a year after the surgery**

<b>n</b>	<b>Item 1 Type of scar (Value from 0 to 10)</b>	<b>Item 2 Length of the scar (Value from 0 to 10)</b>	<b>Item 3 Recommendation of the type of operation (Value yes - no)</b>	<b>Item 4 Which one is more important, aesthetics or functional? (Value 1= aesthetic, 2= functional, 3= indifferent)</b>	<b>Item 5 If a similar length incision could be made, but away from the nipple, would you recommend it? (Value 1= yes, 2= no, 3= indifferent)</b>
1	6	8	No	1	1
2	5	9	No	1	1
3	4	9	No	1	1
4	7	9	No	1	1
5	5	8	No	1	1
6	6	7	No	1	1
7	6	9	No	1	1
8	4	8	No	1	1
9	7	9	No	1	1
10	6	9	No	1	1
11	4	7	No	3	1
12	6	8	No	1	1
n= 12	7(58.3%) > 6	12(100%) >7	12(100%) no	11(91.6%) aesthetic 1(8.3%) indifferent	12 (100%) yes

*n= number of patients, %= percentage*

The results obtained from the questionnaire application, were similar to those previously mentioned, as the first five items evaluate aesthetics aspects of the incision. Respect to the length of the scar all the patients responded with a score greater or equal to 7. On the type of scar more than 50% responded a score greater or equal to 6, regarding the importance of aesthetic value and functional more than 90% gave greater importance to the aesthetic value.

The most interesting thing about the application of this questionnaire, is that none patient recommend this incision and all of them would recommend a surgery in which the scar must be distant from the nipple, even if it was the same length.

The sixth item, which compares the global aesthetic appearance of the mammary region before and after the surgery, showed that patients felt better before the surgery, rather than after it,  $p=0.0063$  Wilcoxon, we considered statistically significant a  $p \leq 0.05$ . If the patients had presented any complications, this would have made the results of the aesthetic evaluation after surgery that was even worse.

Results for Wilcoxon test were as follows: average range before the surgery 2.54, average range one year after the surgery 0.00,  $Z = -1.857$ ,  $p=0.0063$  (Wilcoxon, a  $p \leq 0.05$  was considered statistically significant) (Table 5).

**Table 5. Results of the evaluation of the global aesthetic state performed by the patients themselves before and a year after the surgery (Item 6 of the questionnaire). It was considered statistically significant a  $p < 0.05$  (Wilcoxon test)**

Global evaluation of the aesthetic aspect performed by the patients through the sixth item of the questionnaire N=12		
Patient	Evaluation before surgery	Evaluation a year after surgery
1	7	6
2	7	7
3	7	7
4	7	7
5	5	5
6	5	5
7	6	5
8	7	5
9	7	5
10	6	6
11	6	6
12	6	6
n=12	76	70

$Z = -1.857^a$   
 $p = 0.0063$

*n = number of patients, p = value of p, Z = value of Z*

#### 4. DISCUSSION

Gynaecomastia is the most common abnormality of the mammary gland in the male gender, it may reach an incidence of 32-36% at all ages or up to 64% in adolescents [1-2,15-16]. It occurs mainly in puberty and the extremes of life. The appropriate treatment is very important because patients with gynaecomastia may suffer psychological or personality disorders if not addressed promptly [1-2,17-18].

In this series we found the average age of presentation was 27.5 years, which is inconsistent with those reported in the world literature where is mentioned that presentation occurs mainly during puberty [1,16-18]. Although we found a wide dispersion in the minimum and maximum age of presentation (18-58) years, this is not consistent with reports of other series where is mentioned that gynaecomastia presents at the end of the life [16].

Relating to clinical characteristic on palpation, rubbery consistency was presented in all patients and pain in 75%, coincides with some reports [1], but not others where is mentioned that gynaecomastia can be asymptomatic [17,19]. Some authors report that gynaecomastia presents bilaterally in 75%-100% of the cases, we found a bilaterally presentation only in the 33% of all patients. Hormonal changes are attributed of being responsible for a bilateral affection, but we only found a 33% of bilateral gynaecomastia, finding that may question the hormonal theory about the origin for gynaecomastia.

The estrogens increased at the ends of life have better affinity to mammal gland tissue, therefore, the increase in volume persists. This happens in series where the age of the study population has greater tendency towards the extremes of life than in our series [1,6,17-18].

Regarding the unilateral presentation, it is unknown which is the most affected side, it may be left or right, because the hormonal fixation does not have side preference [1]. The finding of a low incidence 33% of bilateral presentation, the fact that all patients had normal sexual features may support the theory that the hormonal etiology in these countries is uncertain. However, it would be appropriate to perform follow-up studies of the hormonal behavior in men with gynaecomastia in order to demonstrate all the above.

The subdermal mastectomy is made by several incisions [1,19-22]. These incisions can be transareolar, the submammarystria, midline, the axilar line, an inverted omega with extensions, periareolar with extensions, external periareolar, inferior periareolar, among others [1]. Regardless of the incision to be used, post-surgical complications can occur ranging from simple as the presence of seromas to severe as deformities of the region, hyperesthesia, depression, discoloration, necrosis of the nipple-areola complex and unsatisfactory aesthetic results that can cause frustrations for the rest of their lives [1,3,23].

In this series with the used incision (inferior periareolar), a 16.6% of the patients presented decreased sensitivity of the areola. As previously reported, this complication of the subdermal mastectomy by inferior periareolar incision is due to the section of a large number of vessels and nerves that enter the areola from the bottom causing loss or decrease of local sensitivity [1,9-11,24]. This complication can also occur with other type of inferior incisions, as the inverted inferior omega with lateral extensions, among others. Other complications such as the presence of fluid collections, seroma or hematoma can be avoided by the placement of closed drains as well as use of intralesional steroids for possibility of keloid scarring [1-2,20].

The placement of a closed drainage in all the patients made possible the absence of fluid collections in our patients. This same assessment could have been affected by the fact that 50% of patients presented ipsilateral hyperesthesia to the side of the surgery, which could have been avoided by another type of incision than the inferior periareolar incision [1].

We can conclude that Inferior Periareolar Incision may have minor complications, aesthetic results are not good therefore, another incision must be used for this surgical procedure.



## **5. CONCLUSION**

Subdermal Mastectomy should be in lower case by Inferior Periareolar Incision, it does not present severe complications however aesthetic results are undesirable

## **CONSENT**

Patients agreed to participate in this study by completing the Informed Consent. The protocol was duly approved by the Ethics and Research Committee of the Hospital.

## **ETHICAL APPROVAL**

All Authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

## **REFERENCES**

1. Montiel-Jarquín A, Reyes-Páramo P, Ramos-Álvarez G, López-Colombo A, Tinajero Esquivel M, Ruiz-León B. Incisión periareolar externa para el tratamiento de mastectomía subdérmica en hombres con ginecomastia. *Cir Cir.* 2007;75:327-331.
2. Niewoehner C, Schorer A. Gynaecomastia and breast cancer in men. *BMJ.* 2008; 336(7646):709–713.
3. Devoto E, Madariaga M, Arravena L, Lioi X. Etiología de la ginecomastia. Importancia de no sub diagnosticar una ginecomastia patológica. *Rev Med Chile.* 2007;135:189-197.
4. Oroz J, Pelay P, Roldan P. Ginecomastia, tratamiento quirúrgico. *Ann. Sist. Sanit Navarro.* 2005;28(S2):109-116.
5. Castillo P. Ginecomastia. *Cuad Cir.* 2003;17:52-57.
6. Devoto E, Madariaga M, Lioi X, Mardones N. Terapia médica de la ginecomastia con tamoxifeno. Influencia del volumen y duración de la ginecomastia en el resultado terapéutico. *Rev. Med. Chil.* 2007;135(12):1558-1565.
7. Esme D, Beekman W, Hage J, Nipshagen M. Combined use of ultrasonic-assisted liposuction and semicircular periareolar incision for the treatment of ginecomastia. *Ann. Plast. Surg.* 2007;59(6):629-634.
8. Aslan G, Tuncali D, Terzioglu A, Bingul F. Periareolar-transareolar-perithelial incision for the surgical treatment of gynecomastia. *Ann. Plast. Surg.* 2005;54(2):130-134.
9. Mentz H, Ruiz-Razura A, Newall G, Patronella C, Miniell L. Correction of ginecomastia through a single puncture incision. *Aesth. Plast. Surg.* 2007;31(3):244-249.
10. Handschin A, Bietry D, Husler R, Banic A, Constantinescu M. Surgical management of ginecomastia- a 10 year analysis. *World J. Surg.* 2008;32(1):38-44.
11. Prado SA, Castillo DP. Cirugía de acceso mínimo para la ginecomastia Shaver-Lipoaspiración. *Rev. Chil. Cir.* 2003;55(6):613-616.
12. Martínez del Castillo M, Maderna-Graciano O, Camacho-González F, Garcia-Soldevilla N, Gatzambide-Casillas J. Ginecomastia puberal. Revision de 9 casos. *Cir Peditr.* 2004;17:80-84.

13. Noer HH, S e-Nielsen NH, Gottlieb J, Partoft S. Gynecomastia treated by subcutaneous mastectomy using Webster's method. *Ugeskr Laeger*. 1991;153(8):578-580.
14. Calder n W, Cabello R, Israel G, Bassa J, KauakLI, Olgu n F, et al. Ginecomastia y pseudoginecomastia. Tratamiento. *Rev. Chil Cir*. 2009;61(2):131-135.
15. Ru z de Angulo D, Mart nez de Haro L, Ort z A, Munitiz V, Navas D, Abrisqueta J. Valoraci n del resultado est tico percibido por los pacientes apendicectomizados v a laparosc pica mediante tres incisiones. *Cir Esp*. 2011;89(5):317-320.
16. Mladick R. Gynecomastia. *Aesthetic Surg J*. 2004;24:471-479.
17. Rohrich R, Ha R, Kenkel J, Adams W. Classification and management of gynecomastia: Defining the role of ultrasound-assisted liposuction. *Plast Reconstruct Surg*. 2003;111:909-923.
18. Johnson R, Murad H. Gynecomastia: Pathophysiology, evaluation, and management. *Mayo Clin Proc*. 2009;84(11):1010–1015.
19. Sopena M, Salvador J. Gynecomastia. *Rev Med Univ Navarra*. 1997;41(2):42-50.
20. Rodr guez A, Vela A. Evaluaci n diagn stica de la ginecomastia. *Bol. S Vasco-Nav Pediatr*. 2009;41(1):33-37.
21. Saad M, Kay S. The circumareolar incision: A useful incision for gynaecomastia. Aspects of treatment. *Ann R Coll Surg Engl*. 1984;66:121-122.
22. Qutob O, Elah B, Garimella V, Ihsan N, Drew PJ. Minimally invasive excision of gynaecomastia – a novel and effective surgical technique. *Ann R Coll Surg Engl*. 2010;92:198–200.
23. Beausang E, Floyd H, Dunn KW, Orton CI, Ferguson MW. A new quantitative scale for clinical scar assesment. *Plast Reconstr Surg*. 1998;102:1954-1961.
24. Andrades P, Ben tezS, Prado A. Recomendaciones para el manejo de cicatrices hipertr ficas y queloides. *Rev Chil Cir*. 2006;58(2):78-88.

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