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SCRIPTA MANENT EDIZIONI

Late recurrent inflammation and migration of polyalkymide gel for pectus excavatum: a case report


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Summary

Late recurrent inflammation and migration of polyalkymide gel for pectus excavatum: a case report

Bio-Alcamid is permanent filler composed by water (96%) and polymeric polyalkylimide (4%). This material has widely been employed for aesthetic contour defects, rhytides and lipodistrophy. The filler is stable and acts as an "endoprosthesis" due to the fibroblasts that create a thin fibrous capsule in few weeks.
Although the short-term follow-up displayed few complications, literature showed an increasing number of long term complications. These include recurrent inflammation and swelling, migration and infections even more than one year after injection.
We describe the case of a 31 year-old man affected by pectus excavatum that underwent polyalkylimide gel infiltration for correcting the contour defect. In few years he experienced a caudal migration of the filler. After a first attempt of partial percutaneous aspiration of the filler, he displayed recurrent episodes of inflammation and local swelling without infection. We therefore indicated the surgical removal of the mass. The patient healed uneventfully.
Although the procedure is easy and large quantities could be injected in outpatient without the necessity of any donor site, the practitioner should be aware of the high rate of complications of the polyalkylimide gel and others permanent fillers.

KEY WORDS: *Polyalkylimide, Pectus excavatum, Inflammation, Migration, Permanent filler*

Introduction

The polyalkylimide gel (*Bio-Alcamid, Polymekon, Italy*) is a permanent filler composed by water (96%) and synthetic polymeric polyalkylimide (4%). The polymer derives from the acrylic acid and has a reticulated structure.
This permanent filler is non-toxic, hydrophilic, easy to inject and permanent. The gel is stable, resistant to hydrolysis and creates an "endoprosthesis" due to the activity of fibroblasts that form a thin fibrous capsule around the material that is completed by six weeks. No significant giant cell reaction is usually observed [1].
This formulation was used in Europe since CE approval in 2001 for aesthetic purposes and for HIV-/HAART- related lipodystrophy. In Canada was authorized initially for lipodystrophy. In the United States the use was limited to the Parry-Romberg syndrome, while later the approval was withdrawn [2].
The polyalkymide gel became popular for the correction of rythides, minor aesthetic defects and major contour deformities. The ease of use and the "endoprosthesis" effect initially induced the employ also for corrections that required injections of large volumes (> 500 ml). This filler was often proposed as alternative to the autologous fat grafting because avoided any donor site morbidity and the procedure could be performed in outpatients even for large volumes. This filler was also proposed as tamponading agent for vitreous hemorrhage although the gel caused functional and morphological retinal damage in the animal model.
Although the first positive reports that recorded only minor local complications the patients treated with *Bio-Alcamid* displayed a high rate of complications, arising from 24 hours to 3 years after injection [3].
The complications include surface irregularity, infection and skin hyperpigmentation. Complications are observed even more than one year after injection, such as inflammatory nodules, inflammatory reactions, migration and infection.
A large retrospective study by *Schelhe* [4] analyzed retrospectively 3196 over 6 years of time span. The study observed that 4.8% of patients developed a complication, comprising inflammation (3.3%), accumulation (1.5%), hardening of the capsule (0.4%) and migration (1.1%).

Case report

In this article we describe the case of a 31-year-old man that underwent the injection of polyalkylimide gel for the correction of pectus excavatum in 2003. Four years after the injection he observed a caudal migration of the material. Therefore in 2007 he was suggested to undergo a remodeling of the injected material by aspiration with liposuction cannulas. The contour defect was corrected and the postoperative was uneventful. Nonetheless in

2014 he experienced recurrent inflammations of the area, further migration of the material and cutaneous retraction. Therefore he was referred to us.
He was studied with T1, T2, DWI and FIESTA weighted MRI using fat suppression. The imaging revealed the permanent filler in the subcutaneous layer over sternum and xiphoid process, extended for 15 x 13 cm, 4.5 cm thick. The peripheral component had irregular margins with septa.
The mass was surgically removed through a caudal incision and showed thin septa. The material had an incomplete capsule. No evidence of infection was observed. The histological examination of the removed material revealed chronic granulomatous inflammation. No complications were observed in the post-operative period.

Discussion

Late complications after *Bio-Alcamid* injections are described in literature. These include local inflammation, infections, swelling, ulcerations and filler migration, often arising even one year after infiltration. Moreover, as long as the infiltration of *Bio-Alcamid* was electively performed for HAART/HIV-induced lipodystrophy, an high number of immediate and late-onset filler infection was reported. *Nadarajah* reviewed 167 patients that underwent *Bio-Alcamid* infiltration for HIV-related lipodystrophy, recording documented infections in 19% of patients [5].
Our patient experienced recurrent inflammatory episodes with local redness and tenderness although secretions or skin ulceration were not observed.

Figure 1.
31-year-old man affected by pectus excavatum.
The contour deformity was corrected with polyalkylimide gel in 2003.
Four years after the injection he observed a caudal migration of the filler and underwent partial percutaneous aspiration of the material.
The contour defect was corrected and the post-operative was uneventful.
Nonetheless in 2014 he observed recurrent inflammations of the area, further migration of the material and cutaneous retraction.

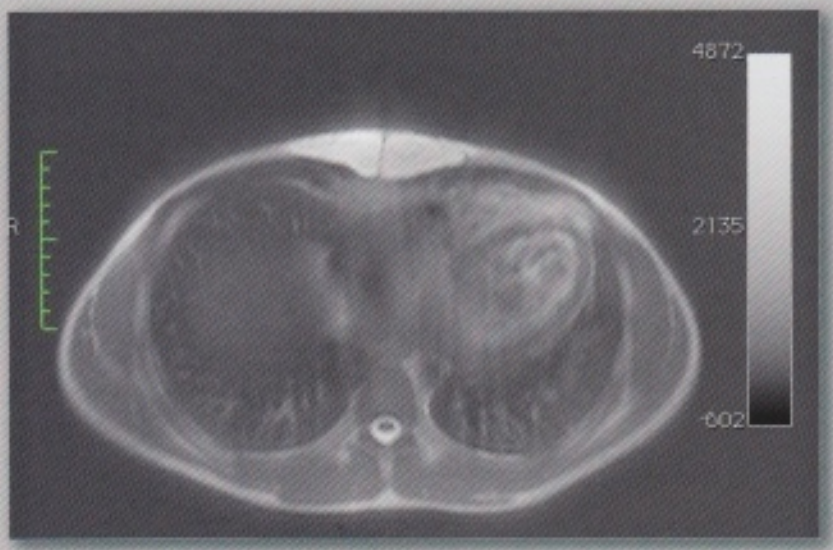

Figure 2.
The imaging revealed the permanent filler in the subcutaneous layer over sternum and xiphoid process, extended for 15 x 13 cm, 4.5 cm thick. The peripheral component had irregular margins with septa).

The patient already underwent in another hospital a suction of the material. This technique was reported in literature by *Khan et al.* [6] that described a successful extraction of *Bio-Alcamid* with large-bore liposuction cannula (3.7 mm) with Mercedes tip. Nevertheless we decided to surgically remove the permanent filler avoiding the persistence of residual gel and further complications. Moreover histological and cultural examination of the specimen could be performed.
The mass could be effectively visualized with T2-weighted MRI using fat suppression (SPIR). Ultrasonography is not advised due to the inferior specificity in comparison with MRI.
The histological examination revealed inflammation with foreign body-type granulomas.
The surgery was carried uneventfully and no complications were reported in the following months.

Conclusion

The use of *Bio-Alcamid* in cosmetic surgery was extended. The filler was considered ideal for correct small and larger contour defects as outpatient procedure, often in alternative to the autologous fat grafting.
Although the initial enthusiastic reports on this filler, the long-term follow-up revealed high rates of recurrent local inflammations, infections and migrations. These complications required removal of the material and antibiotic therapy if needed.
We therefore we discourage the employ of the polyalkylimide gel and advise caution using permanent fillers.

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Cephalometric analysis to evaluate rhinoplasty in Arabs

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Summary

Cephalometric analysis to evaluate rhinoplasty in Arabs

As Middle Eastern rhinoplasty patients has common criteria in both in their original shape and desired nasal morphology and lack of studies concern in documentation for the changes that occur for the nose after rhinoplasty. That is motivated us to do this study with an aim to compare the statistical data for cephalometric measurements of nasal aesthetics of Arab males and females before and after rhinoplasty.

In this study, lateral cephalometry is done for fifteen males and fifteen females aged from 18-40 years. Cephalograms are traced manually; then vertical, horizontal, and angular measurements are taken. Results are analyzed then rhinoplasty done for all cases and followed up for six months when cephalometric analysis done again.

Preoperative and postoperative results were compared and changes tabled and statistically calculated.

Comparison between preoperative and postoperative cephalometric measurements shows significant Upper Nasal Height (UNH) decrease and Lower Nasal Height (LNH) increase, Male Tip projection (TP) significant increase, Significant increase in Naso-Frontal angle (<NF), Significant decrease in columellar rotation angle (<CR) and significant decrease of Bony Nasal angle (<BN). Cephalometric analysis together with other tools as Photographic nasal study for assessment of rhinoplasty give us rational aesthetic data that improve both ethnic groups satisfaction after rhinoplasty and standard numerical data for optimum aesthetic rhinoplasty outcome for each ethnic group.

Key words: Cephalometric in rhinoplasty in Arabs, Value of Cephalometric in rhinoplasty.

Introduction

When approaching ethnic rhinoplasty patients, determining the preoperative goals and confirming the patient's expectations is of paramount importance. The goals of ethnic rhinoplasty should therefore address the patient's desire for preservation or alteration of ethnicity, balance of surrounding features, and adherence to patient desires [1].

Middle Eastern patients make up a large proportion of rhinoplasties performed throughout the world. However, one explanation for the dramatic numbers seen in Middle East countries, may be that the face is often the only visible part of the body in everyday public life. Middle Eastern nasal characteristics present on a gradient between the African-American nose and the Caucasian nose [2]. Standardized, high-quality, preoperative photographs of the nose are critical for preoperative rhinoplasty planning, comparative postoperative assessment, and demonstration of surgical results [3].

The increasing awareness of rhinoplasty as a cosmetic surgery and the increasing number of patients seeking rhinoplasty motivated us to do this study with an aim to compare the statistical data for cephalometric measurements of nasal aesthetics of Arab males and females before and after rhinoplasty.

We recommend to divide Middle Eastern population seeking for rhinoplasty into Middle Eastern proper (Arab) and (non-Arab) as cross cultural, and cross ethnic criteria are close. So that the desired shape of nose nearly identical in various Arab people as we notice during this study.

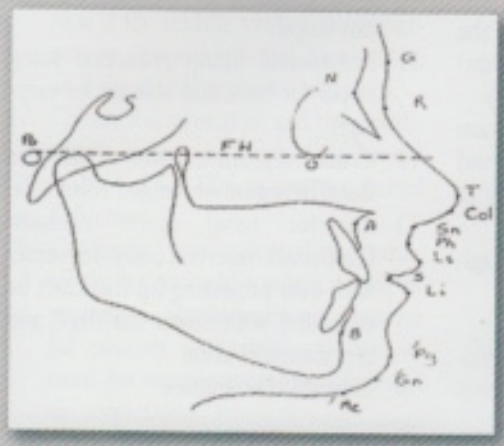
Aim of work

The aim of this study to evaluate the statistical data of cephalometric measurements of Arab males and females nasal aesthetics before and after rhinoplasty.

Patients and methods

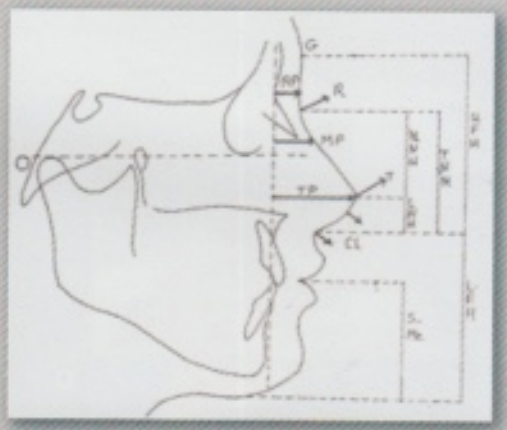
This study was carried out at Plastic Surgery Department of Mansoura University and Elite Hospital in kingdom of Saudi Arabia, from January 2013 to February 2015. We conducted it over 30 patients, 15 males and 15 females with 40 years as a maximum age, 18 years as minimum age. All the cases underwent primary rhinoplasty. Male and female in different groups as the anthropometric measurements differ, Excluding from this study, congenital anomalies affecting head and neck, patients unfit for surgery, patients with prolonged edema or induration post-rhinoplasty more than one year, Each case in this study underwent; full history including history of trauma, rhinitis, sinusitis, epistaxis, airway condition and headache related to sinuses, nasal examination including skin thickness, septal deviation, scar of previous surgery, nasal deviation, dorsal hump, and turbinate

condition, standardized lateral cephalometry done, digital photography includes all views for nasal aesthetics (anterior, lateral, oblique, and basal) taken, cephalograms traced and analyzed, The results of cephalometric analysis were discussed with the patients, pre-operative planning for rhinoplasty according to the data given by cephalometric analysis and photographic study, preoperative routine laboratory investigations (CBC and bleeding profile). All patients in this study underwent operative 1ry rhinoplasty with twenty-nine patients in this study underwent open rhinoplasty while closed rhinoplasty used in one patient. Patients operated in this study followed up one week postoperative and weekly up to 2 months then monthly up to 6 months. Cephalometric analysis done 6 months postoperative and statistical data collected. The statistical analysis of data done by using Excel program 2013 and IBM SPSS (*Statistical Package of Social Science*) version 22. The First part of the data was descriptive in form of mean ± SD (*Standard Deviation*), frequency, and proportion. The second part was analytic to test statistical significance difference between groups. For qualitative data (*Frequency and proportion*) hi-square test was used. For quantitative data (mean ± SD) student t-test was used to compare between groups



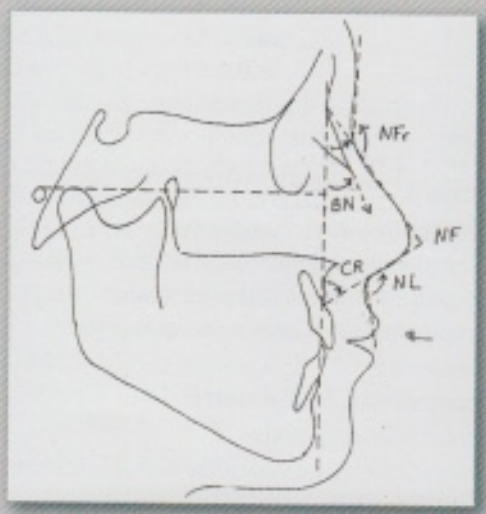
Bony and soft tissue landmarks of lateral cephalometry [4]

Figure 1.
Anthropometric landmarks, Nasion (N), A Point, B Point, Orbital (O), Porion (Po), Frankfort Horizontal (FH), Radix (R), Nasal tip (T), Col (Columella), Subnasal (Sn), Labral superioris (Ls), Labral inferioris (Li), Stomion (St), Soft tissue pogonion (Pg'), Menton (Me'), Gnathion.



Linear vertical and horizontal cephalometric measurements [4]

Figure 2.
Upper facial height (UFH), Lower facial height (LFH), Total nasal height (TNH), Upper nasal height (UNH), Lower nasal height (LNH), Stomion to menton distance (S-Me), Columellar length (CL), Nasal tip projection (TP), Radix projection (RP), Nasal length (RT).



Angular cephalometric measurements [4]

Figure 3.
Nasofrontal (NFr), Columellar rotation (CR), Nasolabial (NL), Bony nasal angle (BN).

Operative management:

- All patients were primary rhinoplasty with twenty-nine patients in this study underwent open rhinoplasty while closed rhinoplasty used in one patient.
- Prophylactic IV injection antibiotic given for all patient one hour before surgery.
- Sequence of basic rhinoplasty used in this study.

The basic operation is a relatively standard sequence that routinely used, but with virtually unlimited variations.

Although every step of the basic rhinoplasty operation does not need to be done in each patient. The operative sequence is individualized for each primary rhinoplasty with certain steps deleted as indicated [5].

Surgical technique of rhinoplasty done in this study:

Open approach used in 29 cases of 30 cases in this study (Figure 4)

1. General anesthesia with appropriate monitors.
2. Four milliliters of 4% cocaine are used to moisten two strips of approximately 18 inches of 1-inch plain nugauze. The gauze is wrung out and placed in each naris.
3. Local injection of lidocaine (2% with 1:100,000 epinephrine) is then infiltrated across the dorsum, columella, and sidewalls for a total volume of 4 mL followed by preparation then waits for 10-15 min.
4. Intranasal nasal pack removal and shave vibrissae.
5. Open approach using transcolumellar and infralobular incisions (V-shaped incision is designed on the columella at its narrowest portion) for open rhinoplasty patients only.
6. Elevation of skin envelope (Dissection performed on the cartilage to avoid interfering with the blood supply of the skin flap).
7. Septal exposure via dorsal cartilaginous septum.
8. Septal harvest and septoplasty. Undermining is started by first dividing the suspensory ligaments, which attach the skin to the underlying domal area. Then the correct dissection plane is identified by finding the bluish color of the dorsal septum. The upper lateral cartilages are separated off the dorsal septum in a subperichondrial plane. An L-shaped strut is preserved, making sure to retain as much cartilage as possible.
9. Reassess operative plan based on septal anatomy findings and size of cartilage harvested.
10. Lateral crus cephalic trim (optional) with Creation of symmetrical alar rim strips.
11. Incremental hump reduction using rasper for bone and scissors for cartilage.
12. Caudal septum excision if there is distal deviation or hanged columella.
13. Anterior nasal spine excision (Optional) reserved only for cases with over projecting tip that can't be corrected with lower cartilage and septal modification.
14. External osteotomies:

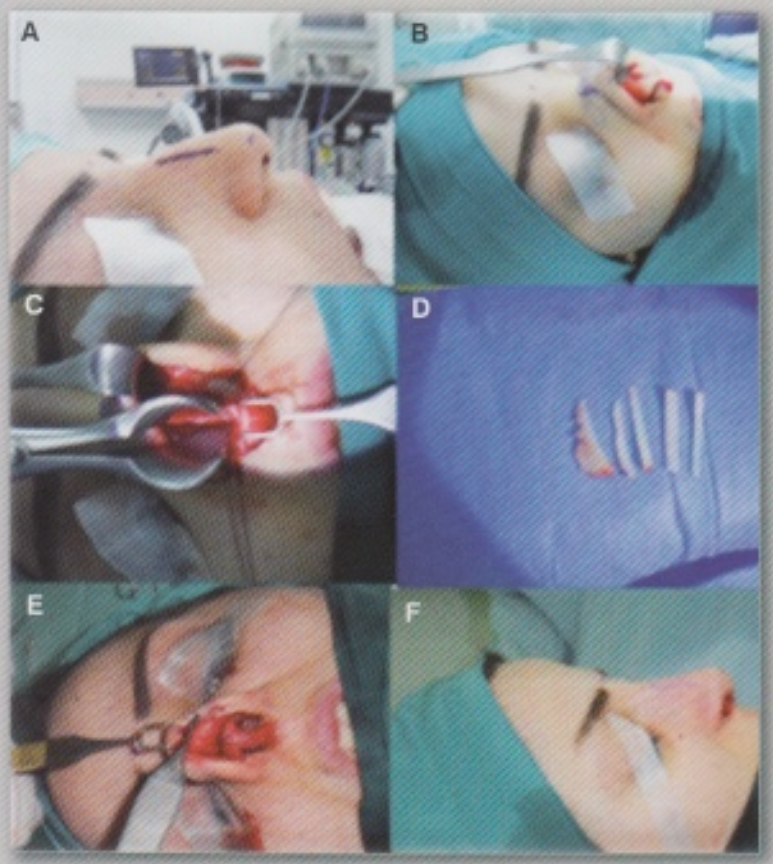


Figure 4.
Operative 1ry open rhinoplasty;
A: preoperative lateral view, marking,
B: exposure of lower lateral cartilage,
C: septoplasty with cartilaginous septum harvested,
D: cartilaginous septum cutting,
E: columellar strut graft,
F: immediate lateral view after lateral osteotomy and spreader graft.

Medial osteotomies used in combination with lateral osteotomies, the medial osteotomy is usually performed first, as this makes it technically easier to perform the subsequent low to low lateral osteotomy. Medial osteotomy performed with a pair of 5 mm curved guarded osteotome (one curved to the right and the other to the left). Lateral osteotomy performed with 2 mm osteotome through external approach.

15. Graft preparation.
16. Spreader grafts (Optional) be placed next if the middle vault appears narrow to support internal nasal valve, or if the dorsal septum is deviated.
17. Columellar strut graft and tip modification suture by using Intercrural sutures of 6-0 PDS to improve domal definition.
18. Cap grafts (optional) used to centralize the tip and add a subtle degree of projection. Shield grafts are reserved for patients with thick tip skin in need for significant enhancement of tip projection.
19. Closure using 5/0 PDS for external incisions and 5/0 vicryl for intranasal one.
20. Alar base modification (optional) to decrease allar base width, allar flare and narrowing of nostrils using boomerang alar base excision technique.
21. Alar rim grafts (optional).Doyle intranasal splint and external aluminum splints fixed with steri-strips.

Approaches for nasal aesthetic correction

i. Tip projection and volume:

1) Increasing tip projection
   Using the open rhinoplasty approach for maximum exposure and control. Simply suturing and defining of medial walls of the domes to each other, tip projection can be increased slightly. Columellar strut using the open approach. Also additional tip projection may be obtained by advancing the lateral crura medially. Tip graft, multilayered onlay grafts, cap grafts, extended dorsal spreader grafts, and even the anchor graft.
2) Decreasing tip projection:
   Reduce or eliminate some or all of the elements that support the tip (but many of these supports are divided with the routine incisions for rhinoplasty).
3) Upward rotation of the tip
   Attachments of the medial crura to the caudal septum should be interrupted. Resection of the caudal septum. Columellar strut is used to maintain or increase rotation of the tip.
4) Downward rotation of the tip.
   Using the following techniques: undermining of the nasal skin, release of the lower lateral cartilages from the upper lateral cartilages and nasal septum, rotation and stabilization of the lower lateral cartilages in a posterior direction, and internal and external postoperative nasal splinting.
5) Reducing tip fullness and width
   Resecting the cephalic segments of the lateral crura. Horizontal mattress suture is placed in the dome, and the angulations is increased by tightening and tying the suture.
6) Alar notching
   Corrected by Alar contour grafts

ii. Correction of septal deformities:

1) Nasal bones/upper lateral cartilage.
   a) A push rasp is utilized in order to remove any bony hump.
      A medial osteotomy is first performed with a 4 or 6 mm osteotome, which is placed medial to the nasal bones and advanced cephalically with careful use of a mallet
   b) A vertical lateral osteotomy is then done with a 2 mm osteotome.
2) Septum
   The mucoperichondrium is elevated off the left side of the septum.
   Once in the correct plane with the glistening, grayish cartilage in view, the blunt end of a periosteal elevator is used to raise the mucoperichondrial flap.
   - Septal tilt and C-shaped deviation correction:
   a) The septal tilt is corrected by initially removing the posterio-caudal portion of the septum, leaving an L-strut septum anteriorly and caudally.
   b) The septum repositioned after removal of a small segment of the overlapping cartilage and fixated in the midline.
   c) An osteotomy of the anterior nasal spine and residual vomerine plate is often necessary in order to place this structure in the midline.
   d) Partial disjunction of the perpendicular plate of the ethmoid and quadrangle cartilage is done only if deemed beneficial to correct the deviation in the cephalic third of the nose.
   e) The L-shaped frame is scored in a cephalocaudal direction on the concave surface if the other measures do not result in straightening the septum.
   f) Bilateral extramucosal stents (Simplestents) are placed and fixed in position with a through-and-through suture. Stents are left for up to three weeks.
      Small defects of the cartilaginous dorsum reconstructed with small layers of patients' own cartilage in the defect of the dorsum. In case of a collapse of the cartilaginous nasal dorsum, Posterior septal cartilage, bony septum, ear- or rib-cartilage are the materials one can choose from.

iii. Lower lateral cartilage:

Tip defining sutures and columellar strut grafts used together with cephalic trim of lateral crus to correct common tip widening and dropped nasal tip.

The medial and lateral crura can be measured using calipers. Depending on the tip projection relative to the dorsum, either the crura of the longer lower lateral cartilage is shortened to match the length of the contralateral side or elongated. This can be achieved by transecting and overlapping the lateral crus and shortening the medial crus. The short lower lateral cartilage is dissected and advanced to the level of the opposite lower lateral cartilage and fixed to the columellar strut.

Postoperative Care and follow up:

- After rhinoplasty all patient received analgesic and oral antibiotics for one week and discharged from hospital same day of the surgery at evening.
- Nasal pack removed 2 days after surgery.

- Internal and external splint removed one week after rhinoplasty.
- Patients operated in this study followed up one week postoperative and weekly up to 2 months then monthly up to 6 months (when analysis of the aesthetic nasal done).
- Photographic and cephalometric analysis done 6 months postoperative and statistical data collected.
- Males and females in different groups as the anthropometric measurements differ.
- The statistical analysis of data done by using Excel program 2013 and IBM SPSS (*Statistical Package of Social Science*) version 22. The First part of the data was descriptive in form of mean ± SD (*Standard Deviation*), frequency, and proportion. The second part was analytic to test statistical significance difference between groups. For qualitative data (Frequency and proportion) hi-square test was used. For quantitative data (mean ± SD) student t-test was used to compare between groups.

Results

Twenty-nine patients subjected to primary rhinoplasty operation and one case operated by closed rhinoplasty. All 30 Patients were Arabian including 20 patients from Saudi Arabia, 7 patients from Egypt, one patient from Jordan, one patient from Syria and one patient from Yemen. All patients included in this study don't have major complication from rhinoplasty such as abscess, cellulitis, granuloma, nasal cyst formation of lateral bony walls, systemic Anosmia, unstable bony pyramid, intracranial Arteriovenous fistula, epiphora, redundant soft tissue, canalicular bleeding, stair-step deformity, neuromuscular injury, nasal bone asymmetry or intracranial injury. Although there are ecchymosis in most of cases which is resolved within 7-15 days, nasal tip and lateral dorsum edema always resolved within 6 months postoperative but there are 2 cases with prolonged edema that resolved within 6 to 12 months and so cephalometric analysis delayed until edema and induration decreased to satisfactory level.

Diluted *triamcinolone* (*Kenacort®*) 1:1 normal saline injected subdermal in nasal tip area for 4 cases in this study with excess edema one week and 3 weeks postoperative and we noticed resolution of edema and induration more quickly. One case had excess reduction of nasal bone as result of over excision and rasping, that was corrected by adepofacial graft harvested from postauricular area under local anesthesia after six months from the 1st surgery and patient satisfied with the final results.

Clinical cases

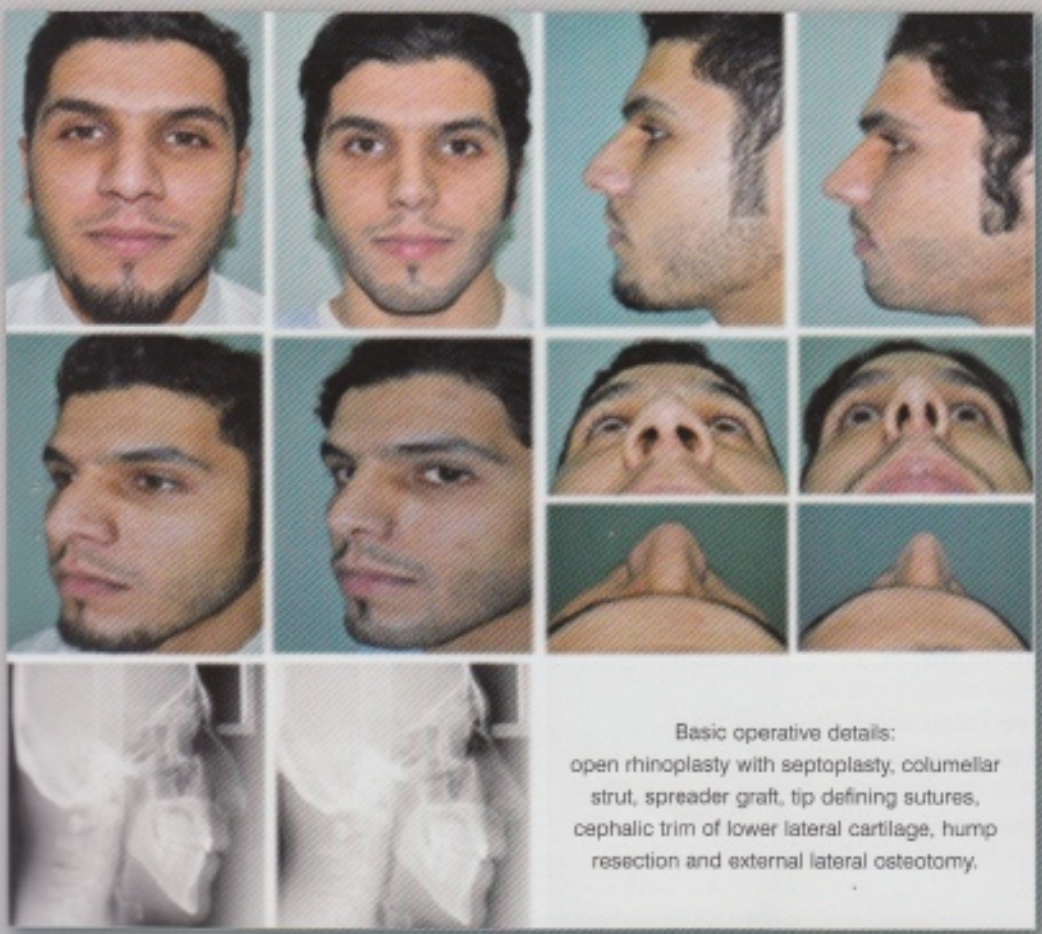


Figure 5.
Case 1, photo study and cephalometric analysis of male case 1, left side preoperative and right side postoperative, cephalometric changes; UNH changed from 56 mm (preoperative) to 51 mm (postoperative), LNH from 8 to 13, RT changed from 60mm to 57 mm, CL from 10 mm to 12 mm, TP from 32 mm to 34mm, CR from 86 to 69, NFr from 148 to 153, NL from 103 to 113, BN from 40 to 30.

Figure 5.
Case 2, photo study and cephalometric analysis of female case 1, left side preoperative and right side postoperative, cephalometric changes; UNH changed from 44 mm (preoperative) to 43 mm (postoperative), LNH from 12 to 13, RT unchanged, RP unchanged, CL unchanged, TP from 29.5 mm to 31 mm, CR from 68 to 56, NFr from 152 to 156, NL from 110 to 122, BN from 40 to 34.

Cephalometric measurements results

The cephalometric measurements results for preoperative and postoperative Arab male sample using tangent line method for tracing.

Comparison between preoperative and postoperative Male and Female vertical measurements shows no changes in *Upper Facial Height* (UFH), *Lower Facial Height* (LFH), *Total Nasal Height* (TNH), and *Stomion to Mention height* (S-Me). *While both Upper Nasal Height* (UNH) and *Lower Nasal Height* (LNH) shows significant changes (UNH decreased and LNH increased) which confirm the prevalent ascend of the vertical level of nasal tip point during most of rhinoplasty surgery.

Male Tip projection (TP) shows significant increase postoperative while female TP shows insignificant postoperative increase, Radix projection in postoperative female sample not changed.

Comparison between preoperative and postoperative Male and Female angular measurements shows

1- Significant increase in Naso-Frontal angle (<NF) which is explained by increased demand for nasal dorsal reduction than augmentation.
2- Significant decrease in columellar rotation angle (<CR) in female sample as result of upwards rotation of columellar tip complex.
3- Significant decrease of Bony Nasal angle (<BN) as result of prevalent hump resection in most cases.
4- Decreased BN angle in 25 cases, 5 cases not changed (3 male and 2 female).

Table 1.

Preoperative and postoperative cephalometric vertical measurements of male patients included in this study.

UFH, LFH, TNH and S.me shows no changes after rhinoplasty. While UNH increased and LNH decreased in all patients.

	Case 1		Case 2		Case 3		Case 4		Case 5	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
UFH	70	70	72	72	71	71	74	74	77	77
LFH	69	69	68	68	71	71	70	70	73	73
TNH	52	52	53	53	52	52	56	56	64	64
UNH	41	39	43	42	40	39	45	43	56	51
LNH	11	13	10	11	12	13	11	13	8	13
S.me	49	49	45	45	47	47	46	46	54	54
	Case 6		**Case 7**		**Case 8**		**Case 9**		**Case 10**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
UFH	73	73	70	70	69	69	73	73	72	72
LFH	79	79	70	70	72	72	71	71	72	72
TNH	54	54	52	52	49	49	52	52	55	55
UNH	43	42	43	41	40	39	44	42	45	42
LNH	11	12	9	11	9	10	8	10	10	13
St.me	53	53	50	50	52	52	53	53	53	53
	Case 11		**Case 12**		**Case 13**		**Case 14**		**Case 15**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
UFH	73	73	74	74	72	72	73	73	74	74
LFH	71	71	70	70	69	69	69	69	70	70
TNH	52	52	55	55	51	51	55	55	57	57
UNH	43	40	44	43.5	42	40	46	43	45	44
LNH	9	12	11	12.5	9	11	9	12	12	13
S.me	44	44	43	43	45	45	43	43	46	46

Table 2.

Preoperative and postoperative cephalometric horizontal measurements of male patients included in this study:

RT increased in 11 cases and decreased in 4 cases, while RP fixed in 14 cases and increased in 1 cases, TP increased in all cases, finally CL increased in 7 cases and fixed in 8 cases.

	Case 1		Case 2		Case 3		Case 4		Case 5	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
RT	48	46	45	46	43.5	44.5	53	50	60	57
RP	6.5	6.5	7	7	6	6	7	7	6	6
TP	28.5	32	27	28.5	25	29	35.5	36	32	34
CL	8.5	8.5	8	9	8	8	10	10	10	12
	Case 6		**Case 7**		**Case 8**		**Case 9**		**Case 10**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
RT	46	44	47	45.5	44	41.5	51	49	59	56
RP	7	7	7.5	8	6.5	6.5	7	7	7	7
TP	27.5	31.5	27.5	28.5	25	29.5	34	35	30	34
CL	8	8	9.5	10	8	8.5	10	10	9	10
	Case 11		**Case 12**		**Case 13**		**Case 14**		**Case 15**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
RT	48	46	47	48	44	45	52	50.5	59	56
RP	7.5	7.5	8	8	7	7	8	8	8	8
TP	30	32.5	29.5	33.5	28	29.5	34	35	31	34
CL	9	9	10.5	11	8.5	8.5	11	11	10	11

Pre = preoperative, Post = postoperative.

Table 3.

Preoperative and postoperative cephalometric angular measurements of male patients included in this study.

<CR angle decreased in all patients. <NFr angle increased in 11 cases and fixed in 4 cases. <NL angle increased in 12 cases and decreased in 3 cases. <BN angle decreased in 12 cases and fixed in 3 cases. The cephalometric measurements results for preoperative and postoperative Arab female sample using tangent line method for tracing.

	Case 1		Case 2		Case 3		Case 4		Case 5	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
<CR	77	70	84	67	63	68	74	58	86	69
<NFr	145	146	148	149	146	146	138	142	148	153
<NL	105	107	96	107	119	116	100	120	103	113
<BN	43	39	36	34	30	30	48	42	40	30
	Case 6		**Case 7**		**Case 8**		**Case 9**		**Case 10**	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
<CR	78	71	83	69	65	70	74	60	83	68
<NFr	143	144	146	148	144	144	136	140	146	150
<NL	102	105	97	105	113	110	99	117	100	105
<BN	45	38	36	33	31	31	47	41	40	31
	Case 11		**Case 12**		**Case 13**		**Case 14**		**Case 15**	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
<CR	74	69	84	67	63	68	74	58	86	69
<NFr	141	142	145	146	144	145	140	144	147	150
<NL	102	105	99	108	115	112	100	118	102	112
<BN	44	40	35	33	31	31	46	41	39	30

	Case 1		Case 2		Case 3		Case 4		Case 5	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
UFH	68	68	70	70	69	69	70.5	70.5	71	71
LFH	67	67	67.5	67.5	64.5	64.5	67.5	67.5	69	69
TNH	49	49	57	57	56	56	57	57	56	54
UNH	39	38	48	45	44	43	48	46.5	42	40.5
LNH	10	11	9	12	12	13	9	10.5	12	13.5
S-me	48	48	47	47	44.5	44.5	46	46	45.5	45.5
	Case 6		Case 7		Case 8		Case 9		Case 10	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
UFH	69	69	71	71	68	68	72	72	70	70
LFH	67	67	69	69	66	66	68	68	69	69
TNH	51	51	57	57	54	54	55	55	53	53
UNH	41	40	47	45	42	41	46	45	41	40
LNH	10	11	10	12	12	13	9	10	12	13
S-me	46	46	47.5	47.5	47	47	46	46	47	47
	Case 11		Case 12		Case 13		Case 14		Case 15	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
UFH	68	68	70.5	70.5	69	69	72.5	72.5	71	71
LFH	68	68	69	69	64	64	67	67	69	69
TNH	50	50	55	55	57	57	56	56	52	52
UNH	40	39	46	45	46	45	47	46	41	40
LNH	10	11	9	10	11	12	9	10	11	12
S-me	48	48	47	47	44	44	46	46	45.5	45.5

Table 4.
Preoperative and postoperative cephalometric vertical measurements of female patients included in this study:

UFH, LFH, TNH and S.me shows no changes after rhinoplasty. While UNH increased and LNH decreased in all patients.

	Case 1		Case 2		Case 3		Case 4		Case 5	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
RT	48	47	53	50	52	52	57	54	47	46
RP	7	7	7	7	6.5	6.5	6	6	6	6
TP	32	32.5	29	29	29.5	31	26	28	29	30
CL	7	8	9	10	10	10	9.5	11	11	12
	Case 6		Case 7		Case 8		Case 9		Case 10	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
RT	49	48	50	49	51	51	57	54	46	47
RP	7.5	7.5	7	7	7	7	8	8	6	6
TP	33	31	30	32	29	32	27	33	28	30
CL	8	8	8	10	9.5	10.5	9	10	10	10
	Case 11		Case 12		Case 13		Case 14		Case 15	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
RT	50	49	51	48	50	50	55	52	45	46
RP	7	7	7.5	7.5	6.5	6.5	7	7	7	7
TP	34	32	30	31.5	30	33	27	32	28	30.5
CL	9	9	9	10	9	10.5	8.5	9.5	9	9.5

Table 5.
Preoperative and postoperative cephalometric horizontal measurements of female patients included in this study:

RT decreased in 10 cases, fixed in 3 cases and increased in 2 cases, while RP fixed in 15 cases, TP increased in 14 cases and fixed in 1 case, finally CL increased in 11 cases and fixed in 4 cases.

	Case 1		Case 2		Case 3		Case 4		Case 5	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
<CR	72	70	78	70	68	56	82	72	70	69
<NFr	140	142	143	148	152	156	144	148	139	143
<NL	110	110	95	118	110	122	95	107	110	112
<BN	42	38	42	33	40	34	43	33	34	34
	Case 6		Case 7		Case 8		Case 9		Case 10	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
<CR	73	71	77	69	69	60	80	70	71	68
<NFr	141	144	140	148	150	151	140	146	130	139
<NL	109	110	96	116	108	116	96	108	108	110
<BN	43	39	43	34	41	35	44	34	35	35
	Case 11		Case 12		Case 13		Case 14		Case 15	
	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.
<CR	71	69	77	71	69	60	80	73	71	70
<NFr	139	140	144	146	150	154	141	144	130	135
<NL	107	106	97	113	105	110	94	105	107	111
<BN	41	36	45	36	44	40	40	37	40	38

Table 6.
Preoperative and postoperative cephalometric angular measurements of female patients included in this study:

<CR angle decreased in all patients.
<NFr angle increased all cases.
<NL angle increased in 13 cases and decreased in 2 cases.
<BN angle decreased in 13 cases and fixed in 2 cases.

Descriptive statistics of male patients lateral cephalometric measurements results:

Table 7.
Descriptive statistics of preoperative male patient measurements.

	N	Minimum	Maximum	Mean		Std.
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
UFH	15	69.00	77.00	72.4667	.51517	1.99523
LFH	15	68.00	79.00	70.9333	.67236	2.60403
TNH	15	49.00	64.00	53.9333	.90220	3.49421
UNH	15	40.00	56.00	44.0000	.97590	3.77964
LNH	15	8.00	12.00	9.9333	.34457	1.33452
S-Me	15	43.00	54.00	48.2000	1.03372	4.00357
RT	15	43.50	60.00	49.7667	1.47428	5.70985
RP	15	6.00	8.00	7.0667	.16809	.65101
TP	15	25.00	35.50	29.6333	.82587	3.19859
CL	15	8.00	11.00	9.2000	.26186	1.01419
<CR	15	63.00	86.00	76.5333	2.07219	8.02555
<NFr	15	136.00	148.00	143.8000	.92685	3.58967
<NL	15	96.00	119.00	103.4667	1.75626	6.80196
<BN	15	30.00	48.00	39.4000	1.56388	6.05687

Table 8.
Descriptive statistics of postoperative male patient measurements.

	N	Minimum	Maximum	Mean		Std.
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
UFH	15	69.00	77.00	72.4667	.51517	1.99523
LFH	15	68.00	79.00	70.9333	.67236	2.60403
TNH	15	49.00	64.00	53.9333	.90220	3.49421
UNH	15	39.00	51.00	42.0333	.77224	2.99086
LNH	15	10.00	13.00	11.9667	.28647	1.10948
S-Me	15	43.00	54.00	48.2000	1.0337	4.00357
RT	15	41.50	57.00	48.3333	1.22733	4.75344
RP	15	6.00	8.00	7.1000	.17728	.68661
TP	15	28.50	36.00	32.1667	.67023	2.59578
CL	15	8.00	12.00	9.6333	.32170	1.24595
<CR	15	58.00	71.00	66.7333	1.11896	4.33370
<NFr	15	140.00	153.00	145.9333	.91270	3.53486
<NL	15	105.00	120.00	110.6667	1.34754	5.21901
<BN	15	30.00	42.00	34.9333	1.20106	4.65168

Descriptive statistics of female patients lateral cephalometric measurements results:

Table 9.
Descriptive statistics of preoperative for female patient measurements.

	N	Minimum	Maximum	Mean		Std.
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
UFH	15	68.00	72.50	69.9333	.39299	1.52206
LFH	15	64.00	69.00	67.7333	.36796	1.42511
TNH	15	49.00	57.00	54.2000	.69144	2.67795
UNH	15	39.00	48.00	43.8667	.80986	3.13657
LNH	15	9.00	12.00	10.3333	.31873	1.23443
S-Me	15	44.00	48.00	46.3333	.30342	1.17514
RT	15	45.00	57.00	50.7333	.93842	3.63449
RP	15	6.00	8.00	6.8667	.15013	.58146
TP	15	26.00	34.00	29.4333	.57501	2.22700
CL	15	7.00	11.00	9.0333	.24624	.95369
<CR	15	68.00	82.00	73.8667	1.20264	4.65781
<NFr	15	130.00	152.00	141.5333	1.62383	6.28907
<NL	15	94.00	110.00	103.1333	1.70676	6.61024
<BN	15	34.00	45.00	41.1333	.80396	3.11372

	N	Minimum	Maximum	Mean	Std.	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
UFH	15	68.00	74.00	70.8667	.46667	1.80739
LFH	15	64.00	69.00	67.7333	.36796	1.42511
TNH	15	49.00	57.00	54.2000	.69144	2.67795
UNH	15	38.00	46.50	42.6000	.74674	2.89211
LNH	15	10.00	13.50	11.6000	.30938	1.19821
S-Me	15	44.00	48.00	46.3333	.30342	1.17514
RT	15	46.00	54.00	49.5333	.68220	2.64215
RP	15	6.00	8.00	6.8667	.15013	.58146
TP	15	28.00	33.00	31.1667	.37374	1.44749
CL	15	8.00	12.00	9.8000	.28785	1.11484
<CR	15	56.00	73.00	67.866	1.29050	4.99809
<NFr	15	135.00	156.00	145.60	1.44354	5.59081
<NL	15	105.00	122.00	111.60	1.21420	4.70258
<BN	15	33.00	40.00	35.733	.57293	2.21897

Table 10.
Descriptive statistics of postoperative female patient measurements.

T-test for comparing between preoperative and postoperative male and female lateral cephalometric measurements results:

UFH, LFH, TNH and S-Me measurements are not changed.

		Mean	Std. deviation	t value	P sig.
UNH	Pre.	44.0000	3.77964	6.50	0.000**
	Post.	42.0333	2.99086		
LNH	Pre.	9.9333	1.33452	7.10	0.000**
	Post.	11.9667	1.10948		
RT	Pre.	49.7667	5.70985	3.47	0.004
	Post.	48.3333	4.75344		
RP	Pre.	7.0667	.65101	1.00	0.334
	Post.	7.1000	.68661		
TP	Pre.	29.6333	3.19859	-7.03	0.000**
	Post.	32.1667	2.59578		
CL	Pre.	9.2000	1.01419	2.74	0.016
	Post.	9.6333	1.24595		
<CR	Pre.	76.5333	8.02555	4.40	0.001
	Post.	66.7333	4.33370		
<NFr	Pre.	143.8000	3.58967	-4.90	0.000**
	Post.	145.9333	3.53486		
<NL	Pre.	103.4667	6.80196	3.67	0.003
	Post.	110.6667	5.21901		
<BN	Pre.	39.4000	6.05687	5.15	0.000**
	Post.	34.9333	4.65168		

*** p <.001 = high significant.*

Table 11.
Paired t-test for comparing between preoperative and postoperative male measurements.

UFH, LFH, TNH and S-Me measurements are not changed.

		Mean	Std.	t value	P sig.
UNH	Pre.	43.8667	3.13657	8.72	0.000**
	Post.	42.6000	2.89211		
LNH	Pre.	10.3333	1.23443	-8.72	0.000**
	Post.	11.6000	1.19821		
RT	Pre.	50.7333	3.63449	3.15	0.007
	Post.	49.5333	2.64215		
TP	Pre.	29.4333	2.22700	-3.09	0.008
	Post.	31.1667	1.44749		
CL	Pre.	9.0333	.95369	-3.94	0.001
	Post.	9.8000	1.11484		
<CR	Pre.	73.8667	4.65781	6.12	0.000**
	Post.	67.8667	4.99809		
<NFr	Pre.	141.5333	6.28907	-6.81	0.000**
	Post.	145.6000	5.59081		
<NL	Pre.	103.1333	6.61024	-4.40	0.001
	Post.	111.6000	4.70258		
<BN	Pre.	41.1333	3.11372	6.12	0.000**
	Post.	35.7333	2.21897		

*** p <.001 = high significant.*

Table 12.
Paired t-test for comparing between preoperative and postoperative female measurements.

Significant decrease in Stomion to menton vertical height in this study than previous study results of normal anthropometric measurements shows that the study sample have lower third facial height of the face than previous study that may be as result of wider racial group included in this study.

As regard for nasolabial angle (<NL) in preoperative female sample in the study reveals that significantly decreased angle than normal measurements with patients request to more obtuse angle (elevation of tip- columellar units).

Columellar rotation angle (<CR) decreased after rhinoplasty As a result of columellar-tip complex rise.

Comparison between preoperative and postoperative Male and Female vertical measurements shows no changes in Upper Facial Height (UFH), Lower Facial Height (LFH), Total Nasal Height (TNH), and Stomion to Mention height (S-Me). While both Upper Nasal Height (UNH) and Lower Nasal Height (LNH) shows significant changes which confirm the prevalent ascend of the vertical level of nasal tip point during most of rhinoplasty surgery.

Male Tip projection (TP) shows significant increase postoperative while female TP shows postoperative increase which are insignificant, Radix projection in postoperative female sample not changed.

Comparison between preoperative and postoperative Male angular measurements shows

5- Significant increase in Naso-Frontal angle (<NF) which is explained by increased demand for nasal dorsal reduction than augmentation and Nasal Radix augmentation than reduction.
6- Significant decrease in columellar rotation angle (<CR) in female sample as result of upwards rotation of columellar tip complex.
7- Significant decrease of Bony Nasal angle (<BN) as result of prevalent hump resection in most cases.
8- Decreased BN angle in 25 cases, 5 cases not changed (3 male and 2 female).

Discussion

Some rhinoplasty surgeons still believe that; "*in rhinoplasty, the Caucasian nose still predominant as the gold standard of beauty*" [6]. Others highlighted the concept that the nose should be in harmony with the face and the race of the individual [7]. In a survey of non-Caucasians revealed that the most of patients considering rhinoplasty did not desire Caucasian noses [8].

Detailed soft tissue analyses are widely used for research and clinical purposes in orthodontics, orthognathic surgery and nasal profile assessment [9]. The available norms derived from Caucasian Americans cannot be applied to other races unless it is modified. *Alcalde and co-workers* developed soft tissue norms for Japanese adults and they found that analyses based on Caucasian norms are not applicable as a reference for the diagnosis and treatment of Japanese patients [10]. Comparative studies have been done for other countries such as in Kingdom of Saudi Arabia [11], in Korea [12], and in Egypt [4].

The fact that each rhinoplasty case must be individualized, and the identification of the normal range of the cephalometric measurements for particular population is necessary, and hence the diagnosis of abnormalities can be possible [13].

Broadbent was the first investigator of cephalometry in orthodontic patients in 1931, and it has been applied to conditions ranging from craniofacial syndromes to sleep apnea to the evaluation of implant integration [14]. Newly and less frequently, the lateral cephalometric analysis used to setback reference measurements for the nose. And once in a while take place the lateral cephalometric study to address cases of rhinoplasty.

Bahman Guyuron used the simple technique of full-scale life-size photography for planning rhinoplasty cases. He also used cephalometry as an adjuvant tool for his planning without the use of any computer program [15].

Using dimensional assessments for the nose can be extremely valuable in the analysis and documentation of nasal contours techniques. This value, of course, plays a role pre-rhinoplasty, during, and post-rhinoplasty, especially when long-term follow-up is desired. The standard up till now in most offices is that of reproducible photography, since it is a great method for documentation and easy to use. Many other methods are available, such as cephalometrics, xeroradiographs, facial moulages, selected measuring devices, and animated photography. However, all of these seem to follow behind the standard photographic method [16].

Having more than one method of assessment for nasal contour is always helpful, and a measurement other than an angular one is useful to support the workup [16, 20]. So combination of vertical, horizontal, and angular cephalometric measurements together with photographic study used in this study.

Data has been collected from this study regarding vertical measurements indicate that rhinoplasty does not affect Upper Nasal Height (UNH), Lower Nasal Height (LNH), Stomion to Menton (S-Me) nor total nasal height, although we have one case with augmented radix but still with fixed TNH measurements post-operative. While TNH was fixed, complementary UNH decrease and LNH increase noticed in all 30 cases. So the vertical position of the nasal tip point moves up in all cases.

Although, there are two specific illusions of measurement go hand in hand, that of nasal tip rotation and that of nasal tip projection and the awareness of one is required for the awareness of the other [16]; We found that tip rotated upwards (revealed by decreased UNH and increased LNH) in all cases accompanied with tip projection (TP) increase in 29 cases in this study.

Significant difference in Stomion to menton (S-Me) vertical height in this study than normal anthropometric measurements indicate that S-Me has wide range of difference among same ethnic groups and invalidity to use S-Me as reference for nasal length aesthetics.

The relation between TNH and LFH described by *Powell* and *Humphreys* in 1984 that proportion should be approximately 43% for the TNH and 57% for the LFH as related to the total length from the

nasion to the menton are consonant with our study results and it is good reference than using S-Me distance for planning nasal length.

Goode's method uses a ratio derived from the ala-to-tip measurement divided by the radix-to-tip length (RT), which should fall within a range of 0.55 to 0.60. This method not only considers the dorsal measurement as seen in profile, but also the measurement of nasal projection from ala to tip. This method rather accurately describes tip projection [16]. By the same approach but with different ratio, tip projection (TP) to RT in this study should fall within range of 0.60 to 0.66 and we reported that RT changes showed wide range variability among rhinoplasy cases included in this study as we noticed RT decrease in 21 cases, fixed in 3 cases and increased in 6 cases. On the other hand TP increased in 29 cases of 30 cases included in this study but TP/RT ratio returned to be within normal range after rhinoplasty in all cases. The nasofrontal angle in an aesthetically pleasing profile average described by *Powell* and *Humphreys* in 1984 from 125 to 135 degrees. The actual angle can be modified to give the illusion of a longer nose (opened angle) or shorter nose (deepened angle), since surgical manipulation can deepen or fill the angle or shift its vertex from 6-8 mm inferiorly or superiorly. While its range in our study from 130 to 156 degrees and this range increased postoperatively because of prevalent hump reduction in most cases, on the other hand, *radix projection* (RP) not changed in 29 cases reveals lack of need to elongate the nose in majority of Arab patients. RP not changed in majority of cases after rhinoplasty which reveals satisfaction of most patients with hump reduction than radix augmentation although radix augmentation still desired in certain cases through our study. This confirm the fact that Arab nose characterized by high radix in most populations.

A nasolabial angle in the range of 90 to 120 degrees is considered aesthetic. The male nose usually shows a measurement at the more acute end of the range, whereas the female measurement is generally more obtuse [17]. In this study NL angle increased post-rhinoplasty in 29 cases while preoperative means in male and female was 103 degree, there are increase of means to 110 degree in male and 111 degree in female, which are in line with results of previous studies, accompanying better satisfaction and aesthetic nasal shape of cases in this study.

The nasofacial angle is measured from a line drawn along the nasal dorsum intersects a vertical line drawn tangent to the forehead at the glabella and to the chin at the pogonion. The particular angle formed is of major significance to assess the projection of the nasal dorsum and its average 30-40 degrees [16, 18]. Meanwhile in our study the Bony Nasal (BN) angle is the main tool to measure nasal bone projection (normal average 30 to 42 degree) and it's influenced by either bony hump resection or osteotomies, as BN angle decreased in majority of cases in our study as result of hump reduction.

In the lateral view, the preferred appearance of the columella is a slow curving structure traveling from the nasal tip to the base of the nose with a slight overhang in comparison to the alar base In patients with a deficient columella, columellar abnormalities include disruption of the length ratio between the columella and the lobule, retracted columella may occur in isolation or in combination with other abnormalities and overhanging columella [19], in our study cephalometry can measure columellar length only not in correlation to neighboring structures while columellar length to lobule ratio best evaluated by photographic analysis, in other hand columellar retraction and hanging can be evaluated by cephalometric CR angle assessment but the best way by using lateral view photographic analysis.

The columellar-tip complex is best viewed from a profile position [16] meanwhile the NL and CR angles are reasonable tool to evaluate rotation of this complex.

Bizrah simplifies the division of the "*Middle Eastern*" population into, namely Gulf group (Saudi Arabia, UAE, Kuwait, Iran, and Oman) and non-Gulf groups (Syria, Turkey, Lebanon, Egypt and Morocco), with non-Gulf patients desiring more tip projection and less dorsal height [20].

Race is a social concept used to categorize humans into large and distinct populations or groups by anatomical, cultural, ethnic, genetic, geographical, historical, linguistic, religious, and/or social affiliation [21]. In our study, there are 23 cases from Gulf group and 7 cases from non-Gulf group (Egypt). However, in our opinion it is better to divide Middle Eastern into Arab group and non-Arab group as cross cultural, and racial criteria are closer. So that the desired shape of nose nearly identical in various Arab people as we noticed during this study.

The drawback of cephalometric nasal analysis for rhinoplasty does not give data concerning frontal view nasal problems as tip size, allar width and nasal dorsum width hence the photographic nasal analysis came in issue to overcome these deficiency in cephalometry throughout our study.

Azizzadeh and *Mashkevich* said that the ethnic appearance of the Middle Eastern nose is defined by several unique visual features, particularly a wide overprojecting dorsum, high radix, and a hanging nasal tip. These external characteristics reflect definite structural properties of the bony-cartilaginous nasal framework and soft tissue envelope in Middle Eastern patients. The goal, and the ultimate challenge, of rhinoplasty on Middle Eastern patients is to achieve aesthetic balanced refinement, while avoiding surgical westernization. Detailed understanding of the ethnic visual harmony in a Middle Eastern nose greatly assists in preserving native nasal-facial relationships during rhinoplasty on Middle Eastern patients [22] and We emphasize that rhinoplasty patients of Middle Eastern proper (Arabs) meet on the desired shape of nose requested by the patient and they disperse when we compare original shape of their nose. Esthetic alteration of a Middle Eastern nose follows a different principles and goals compared with rhinoplasties on other ethnic patients.

In other words patient requesting and be more satisfied with:

1. Straight to slightly elevated dorsum than sloping one.
2. Refuse supratip break as it is not traditional in Arabs' nose.

3. Smaller nasal tip as thick skin is common finding.
4. Limited upward nasal tip rotation.
5. Narrow sidewall with broad dorsum satisfy patient more.
6. Smaller nostril with less columellar show.

Our study agree with *Rohrich* and *Ghavami*, when they addressed common goals in Middle Eastern rhinoplasty include: moderate dorsal reduction (avoid over-resection); debulk fibro-fatty tissue (especially at the supratip and paradomal regions) and avoid over-correction of nasolabial angle and over-rotation of the nasal tip; define nasal tip through controlled, cartilage preserving techniques; address tip under-projection through proper rotation and middle/medial crural suturing; address hyperdynamic tip through treatment of depressor septi nasi muscle; reposition and reduce alar bases; correct nostril-tip imbalance and use struts and invisible grafting techniques whenever possible [23], but not agree with narrow nasal dorsum as it is not requested in most of our patients in this study. And to be very cautious when doing debulk of fibro fatty tissue from domes as it endanger vascular supply for supratip skin. And reposition and reduction of alar base with minimal scar show (hidden area) as healing in thick middle Easter skin not favorable. It is critical to improve the strength of the cartilaginous framework in Middle Eastern rhinoplasty with respect to the thick, noncontractile skin/soft-tissue envelope, particularly when moderate to large dorsal reduction is required [23], as we did columellar strut graft in 28 cases in this study to give good support for the tip projection, we observed inadequate tip projection in one case of the two cases we did not use strut graft which made patient unsatisfied with result. Cephalometric analysis together with other tools as Photographic nasal study for assessment of rhinoplasty give us rational aesthetic data that improve both ethnic groups satisfaction after rhinoplasty and standard numerical data for optimum aesthetic rhinoplasty outcome for each ethnic group.

Conclusions

Based on the findings of the present study, the following conclusions were made:

1- Although there were insignificant difference between postoperative results in this study and normal cephalometric measurements for nasal profile that mean success of the operative planning and technique, there were two cases not satisfied with the result outcome.

2- As thick skin of nasal covering is common finding in Arab populations columellar strut is essential if increase nasal tip projection was planned.

3- Bony nasal angle measurements is the most accurate tool for assessment of bony nasal hump and give good idea about nasal bone rasping amount.

4- The majority of Arab cases dislike slopping dorsum and ask for straight line dorsum without supratip break or depressed nasal dorsum in relation to the nasal tip.

5- We recommend to divide Middle Eastern population seeking for rhinoplasty into Middle Eastern proper (Arab) and (non-Arab) as cross cultural, and cross ethnic criteria are close. So that the desired shape of nose nearly identical in various Arab people as we notice during this study.

6- Also, we recommend to perform the analysis on a larger sample.

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