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Central/Inferior Pedicle Technique for Reduction Mammoplasty: A Systematic Review

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Abstract

Background: Intention of reduction mammoplasty is to minimize the breast volume and maintain supply of blood and innervations to NAC (nipple-areola-complex), to lift NAC to higher position in mound of breast using any reliable technique like central pedicle technique. **Methods:** This research selected and observed 15 patients who underwent central pedicle technique for mammoplasty of breast reduction. Age criterium included for this research is 18 years to 60 years for 5 years from Chinese patients. In addition to these, this study systematically reviewed about central pedicle technique for 25 years. Papers were selected from 1996 to 2021. **Results:** Using central pedicle technique, shape and projection of breast were reduced. Such changes of measurements showed that postoperative technique leads to long-term satisfactory impact. **Conclusion:** Central pedicle technique was found to be best, reliable and safe technique for reduction mammoplasty. Reduction mammoplasty is used for reducing the ptotic and large breasts. It provides more satisfactory and good aesthetic outcomes. Majority of patients do not have any complications postoperative. Complications rate is minimal when central pedicle technique is used for reduction mammoplasty. Patients with ptotic and large breasts would have huge advantage postoperative.

Keywords

Central Pedicle Mammoplasty, Breast Reduction, Inferior Pedicle, Chinese Patients, Breast Cancer, Patient Satisfaction

1. Introduction

Reduction mammoplasty in plastic surgery is generally performed operations

*Corresponding author.

and majority of patients have reported high satisfaction level. Ptotic and large breasts cause psychological and physical distress. Aim of reduction mammoplasty is to minimize the breast volume and maintain supply of blood and innervations to NAC (nipple-areolar complex), to lift NAC to higher position in mound of breast, for creating an aesthetic shape which is steady over time and placing scars in suitable place cosmetically [1]. Central pedicle technique or central mound technique of reducing the breast is versatile and it separates the skin of gland, reduces glandular tissue directly and customizes skin tailoring for obtaining project to control tension on closure. Central pedicle method sustains vascular supply to breast gland that involves branches of thoracoacromial and thoracic arteries laterally and superiorly. Extra vessels enter posteriorly gland that involves pectoralis main perforators passed by internal mammary and anteromedial and anterolateral perforators. Clinical experiences of such technique are reliable and safe for patients with marked ptosis or who require huge reductions, thus obviating the requirement for free areola /nipple grafting [2].

Inferior pedicle method or techniques is successfully used in training programs of plastic surgery as reliable and safe techniques for reducing and reshaping the breast with adequate sensation, NAC position, vascularity. It preserves the lactation of breast as continuity of parenchyma of breast is undisturbed at the same time bottoming out seems to be one of main drawbacks that could be avoided by penetrating the huge tissue centrally located under NAC with minimal tissue along the pedicle's lower border. Resection in some breast areas makes this technique more difficult [3].

2. Methods and Materials

This research selected and observed 15 patients who underwent central pedicle technique for mammoplasty of breast reduction. Age criterium included for this research is 18 years to 60 years for 5 years from Chinese patients. In addition to these, this study systematically reviewed about central pedicle technique for 25 years.

2.1. Search Strategy

Papers were selected from electronic databases namely Embase, Pubmed Central and Digital Library. Keywords and headings used for selection for central pedicle technique, inferior pedicle technique, comparison of central versus superomedial pedicle, reduction mammoplasty, breast reduction. Papers were selected from 1996 to 2021.

2.2. Eligibility Criteria

Papers were selected based on technique named central/inferior pedicle technique. Eligibility criteria for full-text articles are research must the central/inferior pedicle technique; reduction mammoplasty; completed studies, appropriate outcomes. Studies which are not included are case studies, abstracts only, incomplete studies, not relevant studies, other pedicle techniques, general

descriptions. Duplicates are not included in full text articles.

From 40 eligible papers, they are categorized based on age (5), duration (8), complication rate (11), comparison (4), follow up post-surgery (6) and review based paper (6).

Flow diagram of selection criteria is described in **Figure 1**.

3. Review of Literature

This paper reviews central/inferior pedicle technique with reduction mammoplasty based on these categories namely age of patients, duration, complication rate after central pedicle technique, comparison of superomedial and inferior pedicle technique, follow up after central pedicle technique and review based studies.

3.1. Central/Inferior Pedicle Technique and Age of Patients

Zhu *et al.* [4] adopted inferior pedicle technique for 18 years to 65 years. Number of patients included in this research is 24 breasts in WISE and 14 breasts in modified ROB. It was found out maximized superior fullness in pole in modified ROB whereas WISE group found high projection in breast and greater medial fullness of pole. Modified central pedicle technique was adopted by Kim *et al.* [5] among 19 - 61 years. 56 patients were selected in this study. It was observed that modified technique for central pedicle for reducing mammoplasty with technique of vertical scar is a versatile technique for reducing breast for all tissue conditions and shapes, by giving a conical breast shape with less burden of scar and high preservation of function for breast. Bilgen *et al.* [6] adopted central and inferior mound pedicle breast reduction in Gigantomastia among 21 - 61 years.

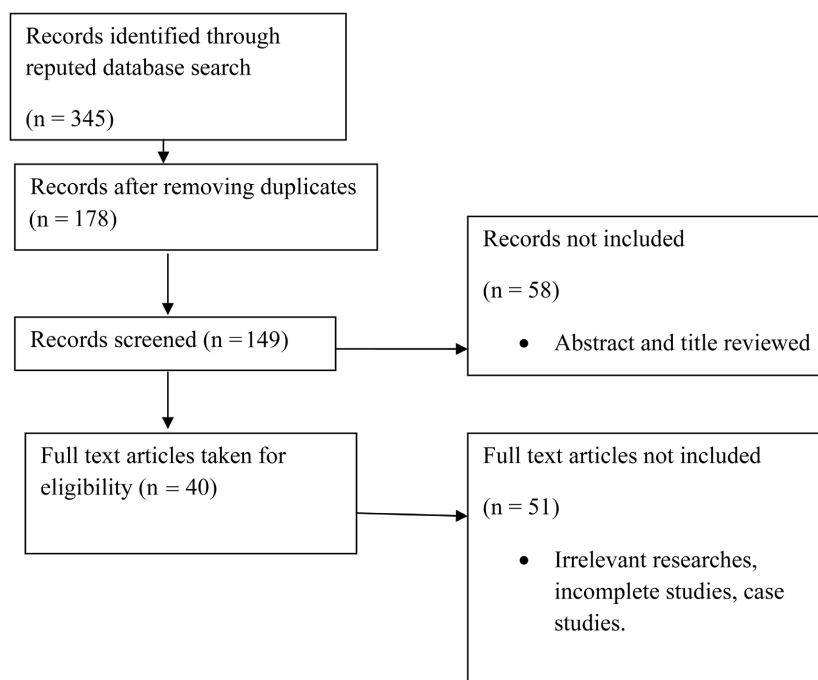


Figure 1. Flow diagram of selection criteria.

72 patients for 3 years were studied. Inferior pyramidal pedicle method is found to be versatile technique for reduction mammoplasty which could be used in all sizes of breast. It preserves the sensation of nipple and potential to lactate with minimal complication rates.

Eskitascioglu and Yontar [7] studied about combined advantages of dermal flap suspension and plaction of inferior pedicle in inverted T-scar mammoplasty for breast reduction for 17 to 76 years. In this research, 121 patients were selected from March 2008 to November 2017. It was clear that combined use of dermal flap suspension and pedicle plaction enhances the position and shape controllability in technique of inferior pedicle, gives a stabilized and projectile breast mound helps to reach satisfactory cosmetic results in long-term and prevents deformities of breast. Erfon *et al.* [8] examined about single central block technique among 17 to 75 years. 2097 patients were underwent single central block for reduction mammoplasties (1556) and mastopexies (541). This technique permits surgeon to get a good breast shape like cone, NAC repositioning and preserving, its sensation and vascularisation without tension on sutures of skin flaps, result in better and smaller scars. **Table 1** represents central/inferior pedicle technique and age of patients.

3.2. Central/Inferior Pedicle Technique and Duration

Nicholson *et al.* [9] studied about modified central mound pedicle for reducing breast. 116 patients underwent bilateral reduction of breast were studied for 7 years. It was clear that pseudoptosis development is delayed for some patients. Bayramicli [10] developed a novel septum-based pedicle (central pillar). 62 patients carried out bilateral reduction for 26.5 months. It was obvious from the findings of the study are central pillar technique is best substitute for glandular breasts among young patients. Double-unit technique with inverted-T incision and superomedio-central pedicle was studied by Wolter *et al.* [11]. 831 reduction mammoplasties are performed among 630 patients for consecutive 7 years. It was clear that proposed technique is effective for achieving reduction of volume. Movassaghi *et al.* [12] studied about central-inferior pedicle using low mammoplasty with horizontal scar. 239 patients were selected for studying central-inferior pedicle using low mammoplasty with horizontal scar for 6 years. Thus it was concluded that BMRT (Boston Modification of Robertson technique) is reliable and safe method for reducing mammoplasty when there is significant ptosis and macromastia.

Wechselberger *et al.* [13] estimated the amount of resected tissue in breast has impact on sensitivity of breast post inferior pedicle mammoplasty. 15 patients were selected for examining the impact on sensitivity of breast post inferior pedicle mammoplasty from April 1999 to January 2000. It was clear that touch sensitivity have been increased for all patients till 6 months post-surgery. Shod [14] carried out a research to examine about inferior pedicle for bilateral mammoplasty for reduction with inverted T-procedure. 23 patients were selected and

Table 1. Central/inferior pedicle technique and age of patients.

S. No	Author and Year	Method and treatment	Age of Patients	Number of Patients	Outcomes
1	Zhu <i>et al.</i> , 2016	Inferior pedicle	18 years to 65 years	24 breasts in WISE and 14 breasts in modified ROB	Maximized superior fullness in pole in modified ROB whereas WISE group found high projection in breast and greater medical fullness of pole
2	Kim <i>et al.</i> , 2017	Modified central pedicle technique	19 - 61 years	56 patients and follow-up duration was 12 - 53 months	Modified technique for central pedicle for reducing mammoplasty with technique of vertical scar is a versatile technique for reducing breast for all tissue conditions and shapes, by giving a conical breast shape with less burden of scar and high preservation of function for breast
3	Bilgen <i>et al.</i> , 2019	Central and inferior mound pedicle breast reduction in Gigantomastia	21 - 61 years	72 patients for 3 years	Inferior pyramidal pedicle method is found to be versatile technique for reduction mammoplasty which could be used in all sizes of breast. It preserves the sensation of nipple and potential to lactate with minimal complication rates
4	Eskitascioglu and Yontar, 2019	Combined advantages of dermal flap suspension and placcation of inferior pedicle in inverted T-scar mammoplasty for breast reduction	17 to 76 years	121 patients from March 2008 to November 2017	Combined use of dermal flap suspension and pedicle placcation enhances the position and shape controllability in technique of inferior pedicle, gives a stabilized and projectile breast mound helps to reach satisfactory cosmetic results in long-term and prevents deformities of breast
5	Erfon <i>et al.</i> , 2019	Single central block technique	17 to 75 years	2097 patients were underwent single central block for reduction mammoplasties (1556) and mastopexies (541)	This technique permits surgeon to get a good breast shape like cone, NAC repositioning and preserving, its sensation and vascularisation without tension on sutures of skin flaps, result in better and smaller scars

observed for 3 years. It was observed that reduction mammoplasty enhanced women quality of life using inferior pedicle technique.

Al-Boudi and Alhassanieh [15] studied about inferior pedicle technique. 32 patients who underwent inferior pedicle procedure were selected from January 2018 to Dec 2020. It was found that suspension of inferior pedicle with the help of crossed dermal flaps prevent bottoming out, do not include alloplastic materials or allogenic materials. Weichman *et al.* [16] analyzed about central mound technique and its outcomes. 13 patients were selected for understanding about central mound technique for 5 years. Proposed technique gives reproducible and reliable outcomes and has to consider patients with asymmetry or macromastia and irradiation history. **Table 2** depicts central/inferior pedicle technique and duration.

3.3. Superomedial versus Inferior Pedicle Technique

Fahmy *et al.* [3] compared inferior pedicle and superomedial pedicle technique. 24 patients were selected for studying inferior versus superomedial pedicle technique during Jan 2017 and Sep 2018. From the findings of the research, it was clear that both inferior and superomedial pedicle technique are feasible, safe and effective for reduction mammoplasty. Kemaloglu and Ozocok [17] compared inferior pedicle and superomedial pedicle technique. 25 patients were selected for observing inferior and 25 patients for superomedial pedicle after 1 year surgery. It was found out that superomedial pedicle was best for skin excision of wise pattern in gigantomastic patients when compared with inferior pedicle. Sapino *et al.* [18] examined about inferior pedicle reduction versus superomedial pedicle. 58 patients were selected from January 2015 to January 2017 for comparing inferior and superomedial pedicle. It was clear that both techniques give satisfactory and stable outcomes. Makboul *et al.* [19] compared superomedial versus inferior pedicle techniques. 60 cases were selected during January 2009 to December 2014. It was observed that breast contour and long term projection were satisfactory among women who underwent superomedial pedicle. Superomedial pedicle performs better than inferior technique. **Table 3** depicts superomedial pedicle versus inferior pedicle technique.

3.4. Central/Inferior Pedicle Technique and Complication Rate

Denewer *et al.* [20] carried out an investigation to study about therapeutic mammoplasty by inferior pedicle among large-breasted persons among early breast cancer with upper quadrants. 35 patients were selected between August 2009 and October 2012. From the findings of the research, it was observed that dehiscence of wound was major complications faced after surgery and 6 patients were suffered. Cammarota *et al.* [21] studied about inferior dermal pedicle method. 74 patients were selected for analyzing inferior dermal pedicle method from January 2005 to January 2013. 62.16 per cent of patients opined that satisfaction after surgery was excellent, 25.67 per cent of patients opined that

Table 2. Central/inferior pedicle technique and duration.

S. No	Author and Year	Method and treatment	Patients and duration	Duration	Outcomes
1	Nicholson <i>et al.</i> , 2018	Modified central mound pedicle for reducing breast	116 patients underwent bilateral reduction of breast	7 years	Pseudoptosis development is delayed for some patients
2	Bayramicli, 2012	Novel septum-based pedicle (central pillar) was developed	62 patients carried out bilateral reduction	26.5 months	Central pillar technique is best substitute for glandular breasts among young patients
3	Wolter <i>et al.</i> , 2021	Double-unit technique with inverted-T incision and superomedio-central pedicle	831 reduction mammoplasties are performed among 630 patients	7 years	Proposed technique is effective for achieving reduction of volume
4	Movassaghi <i>et al.</i> , 2006	central-inferior pedicle using low mammoplasty with horizontal scar	239 patients	6 years	BMRT (Boston Modification of Robertson technique) is reliable and safe method for reducing mammoplasty when there is significant ptosis and macromastia
5	Wechselberger <i>et al.</i> , 2001	Estimate the amount of resected tissue in breast has impact on sensitivity of breast post inferior pedicle mammoplasty	15 patients	From April 1999 to January 2000	Touch sensitivity have been increased for all patients till 6 months post-surgery
6	Shod, 2021	Inferior pedicle for bilateral mammoplasty for reduction with inverted T-procedure	23 patients	3 years	Reduction mammoplasty enhanced women quality of life
7	Al-Boudi and Alhassanieh, 2021	Inferior pedicle technique	32 patients	From January 2018 to Dec 2020	Suspension of inferior pedicle with the help of crossed dermal flaps prevent bottoming out, do not include alloplastic materials or allogenic materials
8	Weichman <i>et al.</i> , 2014	Central mound technique	13 patients	5 years	Proposed technique gives reproducible and reliable outcomes and have to consider patients with asymmetry or macromastia and irradiation history

Table 3. Superomedial versus inferior pedicle technique.

S. No	Author and Year	Method and treatment	Follow up routine	Outcomes
1	Fahmy <i>et al.</i> , 2019	Inferior pedicle Vs. Superomedial pedicle technique	24 patients during Jan 2017 and Sep 2018	Both inferior and superomedial pedicle technique are feasible, safe and effective for reduction mammoplasty

Continued

2	Kemaloglu and Ozocok, 2017	Inferior pedicle and superomedial pedicle technique	25 patients for inferior and 25 patients for superomedial pedicle after 1 year surgery	Superomedial pedicle was best for skin excision of wise pattern in gigantomastic patients when compared with inferior pedicle
3	Sapino <i>et al.</i> , 2021	Inferior pedicle reduction versus superomedial pedicle	58 patients from January 2015 to January 2017	Proposed technique gives satisfactory and stable outcomes
4	Makboul <i>et al.</i> , 2017	Superomedial versus inferior pedicle	60 cases during January 2009 to December 2014	Breast contour and long term projection were satisfactory among women who underwent superomedial pedicle. Superomedial pedicle performs better than inferior technique

satisfaction after surgery was good. 12.17 per cent of patients sated that satisfaction after surgery was fair. Majority of patients were satisfied using inferior dermal pedicle method. Al-Mahmoudy and Reyad [22] conducted a research among patients who underwent inferior pedicle mammoplasty for reduction. 10 patients were chosen from January 2017 to March 2018 for inferior pedicle mammoplasty. It was concluded that satisfactory results were noticed for long-term both subjectively and objectively with good fullness in upper pole and no bottoming out and have vertical scar.

Mandrekas *et al.* [23] studied about inferior pedicle technique. 371 patients were selected to analyze inferior pedicle technique for 10 years. It was concluded from the outcomes that overall rate of complication was 11.4 percent. Elsabbagh and Zayed [24] conducted a research among patients using inferior pedicle technique. 21 patients were selected from June 2012 to March 2017. It was noticed that proposed technique with few technical modifications was given to be safe and excellent technique for reduction of breast of ptotic and large breasts. Filho *et al.* [25] examined about inferior pedicle technique for nipple-areolar among 21 years to 68 years. 40 patients were chosen for studying about inferior pedicle technique and follow up was done till 24 months post-surgery. Complications seen early after surgery were dehiscence of strand mid-point (10%) followed by hematoma (5%).

Jozsef *et al.* [26] developed a modified central pedicle or inferior pedicle. 117 patients were selected for findings the outcomes of modified central pedicle or inferior pedicle. It was observed that proposed method are adopted for decreasing pseudoptosis and migrating nipple down and provide a safe substitute for high satisfaction of patient and long-lasting symmetry. Cho *et al.* [27] carried out an investigation for identifying inferior dermal pedicle or central pedicle. 41 patients were selected for 6 years. It was found out that periareolar mammoplasty for reduction is best for patients who need reduction of breast less than 500 g

each side.

Savaci [28] selected a central pedicle technique to avoid a vertical scar. 13 patients were selected for 3 years to know about central pedicle technique. It was found that no complications were observed using central pedicle technique. Central pedicle flap technique was combined with short submammary scar for reduction mammoplasty studied by Shin *et al.* [29]. Age criteria included in this research are 17 to 60 years. 30 patients were selected for studying central pedicle flap technique. It was noticed that combined method is best for patients who need resection which range from 200 g to 600 g per breast with moderate ptosis degree and good elasticity of skin. Grant and Rand [2] conducted a research to examine about vascularized central pedicle reduction of breast. 239 patients were selected for analyzing vascularised central pedicle technique for breast reduction. It was found that 50 percent is reduced in complication rate and 35 percent is reduced in operative time. Table 4 depicts central/inferior pedicle technique and complication rate.

3.5. Central/Inferior Pedicle Technique and Follow Up Routine

Oliveira [30] studied about inferior pedicle technique, vascularisation and sensitivity of nipple-areola and its complications are observed. Surgical approach was adopted in 60 patients. They were followed up at 15 days, 30 and 60 days; 3 and 6 months and 1 year. From the follow-up routine, it was clear that with technique namely inferior pedicle, vascularisation and sensitivity of nipple-areola complex could be maintained properly and results in minimal complication rates. Widegrow [31] monitored the patients who underwent inferior pedicle fascial suspension. 25 patients followed up for 1 year post-surgery. From the findings of the study, it was found that 2 patients had put more weight post-surgery. It was also noticed that no major complications were seen post-surgery.

Copcu [32] developed a new technique namely COPCUs (conical pilated central U shaped) mammoplasty. 46 patients were monitored post-surgery from 6 to 36 months. It was clear from the findings of the results that all the patients who underwent COPCUs were satisfied with aesthetic and functional outcomes and no one had main complications. Echo *et al.* [33] examined about technique namely inferior pedicle for reducing breast. 38 patients were selected and time for follow-up time post-surgery was seven months. It was concluded that projection and shape of breast were sustained with optimistic aesthetic outcomes during follow-up.

Tripllicated inferior pedicle technique was studied by Samy *et al.* [34]. 15 patients were selected during January 2020 and May 2020 with 6 months follow-up. From the findings of the research, it was found out that proposed technique avoid main complication and breast shape maintained after reduction of breast. Abbate *et al.* [35] studied about central mound mastopexy to correct tubular or tuberous breast deformity for 24-year-old patient. Single patient was selected to study about central mound mastopexy with long-term follow-up. This

Table 4. Central/inferior pedicle technique and complication rate.

S. No	Author and Year	Method and treatment	Patients and duration	Outcomes
1	Denewer <i>et al.</i> , 2013	Therapeutic mammoplasty by inferior pedicle among large-breasted persons among early breast cancer with upper quadrants	35 patients between August 2009 and October 2012	Dehiscence of wound was major complications faced after surgery and 6 patients were suffered
2	Cammarota <i>et al.</i> , 2014	Inferior dermal pedicle method	74 patients from January 2005 to January 2013	Satisfaction after surgery was excellent (62.16 per cent), good (25.67 per cent), fair (12.17 per cent)
3	Al-Mahmoudy and Reyad, 2019	Inferior pedicle mammaplasty for reduction	10 patients during January 2017 to March 2018	Satisfactory results for long-term both subjectively and objectively with good fullness in upper pole and no bottoming out and have vertical scar
4	Mandrekas <i>et al.</i> , 1996	Inferior pedicle technique	371 patients during 10 years	Overall rate of complication was 11.4 percent
5	Elsabbagh and Zayed, 2018	Inferior pedicle technique	21 patients from June 2012 to March 2017	Proposed technique with few technical modifications was given to be safe and excellent technique for reduction of breast of ptotic and large breasts
6	Filho <i>et al.</i> , 2014	Inferior pedicle technique for nipple-areolar for 21 years to 68 years	40 patients and follow up was done till 24 months post-surgery	Complications seen in early after surgery were dehiscence of strand mid-point (10%) followed by hematoma (5%)
7	Jozsef <i>et al.</i> , 2021	Modified central pedicle or inferior pedicle	117 patients	Proposed method are adopted for decreasing pseudoptosis and migrating nipple down and provide a safe substitute for high satisfaction of patient and long-lasting symmetry
8	Cho <i>et al.</i> , 2008	Inferior dermal pedicle or Central pedicle	41 patients for 6 years	Periareolar mammoplasty for reduction is best for patients who need reduction of breast less than 500g each side
9	Savaci, 1996	Central pedicle technique to avoid a vertical scar	13 patients for 3 years	It was found that no complications were observed using central pedicle technique

Continued

10	Shin <i>et al.</i> , 1996	Central pedicle flap technique was combined with short submammary scar for reduction mammoplasty for 17 to 60 years	30 patients	Combined method is best for patients who need resection which range from 200 g to 600 g per breast with moderate ptosis degree and good elasticity of skin
11	Grant and Rand, 2001	Vascularized central pedicle reduction of breast	239 patients	It was found that 50 percent is reduced in complication rate and 35 percent is reduced in operative time

study represents successful reconstruction with tubular and tuberos breast deformity of patient using central mound technique for reducing mastopexy and no prosthetic device is used. **Table 5** represents central/inferior pedicle technique and follow up routine.

3.6. Review Studies for Central/Inferior Pedicle Technique

Swanson [36] compared vertical and central mound pedicle technique. 23 manuscripts were determined and selected for comparing vertical and central mound pedicle. It was found out that central mound pedicle reduce projection of breast than vertical technique. Delong [37] carried out a retrospective review with central mound pedicle for studying about reduction mammoplasty. Papers were selected from 19 years. It was concluded that central mound pedicle is effective and safe approach for mammoplasty of reduction for unilateral symmetrising operations and bilateral macromastia patients. Bustos *et al.* [38] conducted a retrospective review for studying about patients who taken inferior pedicle mammoplasty for reduction. 5 years papers were selected for understanding about inferior pedicle technique for reduction. It provides minimal risk of necrosis. Complications rate is also minimal. Aggarwal [39] compared superior-medial pedicle and inferior pedicle. TIG database was used for obtaining list of oncoplastic trainees and trainees associated with TIG national oncoplastic fellowship. It was concluded that most of surgeons preferred superior-medial pedicle (62%) and 34 percent of surgeons preferred inferior pedicle technique.

Blondeel *et al.* [1] focused on latero-central glandular pedicle technique for reducing breast. 68 procedures were reviewed. It was noticed that because of maximized vascularisation of NAC, complications of wound were minimized with novel technique. NAC sensations were preserved in all cases. Yvorchuk [40] studied about central pedicle technique. Age criteria selected for this research is 18 years to 62 years. 50 consecutive cases were studied. From the findings of the study, it was observed that minimal complication rate was observed. **Table 6** denotes review studies for central/inferior pedicle technique.

Table 5. Central/inferior pedicle technique and follow up routine.

S. No	Author and Year	Method and treatment	Follow up routine	Outcomes
1	Oliveira, 2016	Inferior pedicle technique	Surgical approach adopted in 60 patients. They were followed up at 15 days, 30 and 60 days; 3 and 6 months and 1 year	With technique namely inferior pedicle, vascularisation and sensitivity of nipple-areola complex could be maintained properly and results in minimal complication rates
2	Widegrow, 2005	Inferior pedicle fascial suspension	25 patients followed up for 1 year post surgery	2 patients had put more weight post-surgery
3	Copcu, 2009	New technique was developed namely COPCUs (conical pilated central U shaped) mammoplasty	46 patients monitored post-surgery during 6 to 36 months	All the patients who underwent COPCUs were satisfied with aesthetic and functional outcomes and no one had main complications
4	Echo et al., 2014	Inferior pedicle for reducing breast	38 patients and time for follow-up was seven months	Projection and shape of breast were sustained with optimistic aesthetic outcomes during follow-up
5	Samy et al., 2021	Triplicated inferior pedicle	15 patients during January 2020 and May 2020 with 6 months follow-up	Proposed technique avoid main complication and breast shape maintained after reduction of breast
6	Abbate et al., 2017	Central mound mastopexy to correct tubular or tuberous breast deformity for 24 years old patient	Single patient with long-term follow-up	This represents successful reconstruction with tubular and tuberous breast deformity of patient using central mound technique for reducing mastopexy and no prosthetic device is used

Table 6. Review studies for central/inferior pedicle technique.

S. No	Author and Year	Method and treatment	Papers for review	Outcomes
1	Swanson, 2021	Central mound pedicle and vertical technique is compared	23 manuscripts were determined	Central mound pedicle reduce projection of breast than vertical technique
2	DeLong, 2020	Retrospective review with central mould pedicle	Papers were selected from 19 years	Central mound pedicle is effective and safe approach for mammaplasty of reduction for unilateral symmetrising operations and bilateral macromastia patients
3	Bustos <i>et al.</i> , 2020	Patients who taken inferior pedicle mammaplasty for reduction-retrospective review	5 years	It provides minimal risk of necrosis

Continued

4	Aggarwal, 2016	Comparing superior-medial pedicle and inferior pedicle and	TIG database was used for obtaining list of oncoplastic trainers and trainees associated with TIG national oncoplastic fellowship	Most of surgeons preferred superior-medial pedicle (62%) and 34 percent of surgeons preferred inferior pedicle technique
5	Blondeel <i>et al.</i> , 2003	Latero-central glandular pedicle technique for reducing breast	68 procedures were reviewed	Because of maximized vascularisation of NAC, complications of wound were minimized with novel technique. NAC sensations was preserved in all cases
6	Yvorchuk, 1999	Central pedicle technique for 18 years to 62 years	50 consecutive cases	Minimal complication rate was observed

4. Discussion

This research selected and observed 15 patients who underwent central pedicle technique for mammaplasty of breast reduction. Mean age for 36 years. This study reviews the reduction mammaplasty using central pedicle technique. Reduction mammaplasties were carried out using central pedicle technique that removal excess tissue in breast through hidden scar. Follow up time post-surgery was every 6 months. Ptosis and breast hypertrophy are possible complications of patients who prefer CPT. Some of the complications faced by patients who underwent CPT are seroma or haematoma (blood clot), slight wound dehiscence. It was observed that, when considering measurements of breast, central pedicle technique permits main reduction of preoperative measures of breast and volume around 34.5 percent with optimal reduction of bra size. Complications noticed preoperative surgery was minimized gradually. Unpleasant and intertrigo odors were improved. Back pain, neck pain, breast pain and shoulder pain were minimized post operation significantly. Issues with external and clothing appearance prior surgery were enhanced post-surgery except for short stature patients and aged patients. Young patients are more benefitted using central pedicle technique. Few patients faced some complications like back pain and breast pain. Majority of the patients were reported that shape and projection of breast were reduced significantly. Such changes of measurements shown postoperative technique leads to long-term satisfactory impact. Majority of patients (95 percent) who underwent CPT are satisfied with results. Overall, satisfaction level was satisfactory.

5. Conclusion

Central pedicle technique was found to be best, reliable and safe technique for reduction mammaplasty. Reduction mammaplasty is used for reducing the ptotic and large breasts. It provides more satisfactory and good aesthetic outcomes. Majority of patients who underwent CPT do not have any complications

post-surgery. Complications rate is minimal when central pedicle technique is used for reduction mammoplasty. Patients with ptotic and large breasts would have huge advantage post-surgery. In addition to that, central mound technique is used for all kinds of tissue conditions and size of breast.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Blondeel, N., Hamdi, M., Sijpe, V., Landuyt, V., Thiessen, F. and Monstrey, J.M. (2003) The Latero-Central Glandular Pedicle Technique for Breast Reduction. *British Association of Plastic Surgeons*, **56**, 348-359.
[https://doi.org/10.1016/S0007-1226\(03\)00191-7](https://doi.org/10.1016/S0007-1226(03)00191-7)
- [2] Grant, H. and Rand, P. (2001) The Maximally Vascularised Central Pedicle Breast Reduction: Evolution of a Technique. *Annals of Plastic Surgery*, **46**, 584-589.
<https://doi.org/10.1097/00000637-200106000-00002>
- [3] Fahmy, K., Salama, T., Aly, A., Youssef, T. and Gamal, A. (2019) Superomedial Pedicle vs. Inferior Pedicle Techniques in Reduction Mammoplasty. *Surgery Current Research*, **8**, Article ID: 1000321.
- [4] Zhu, Z., Shah, A., Lentz, R., Sturrock, T., Au, F. and Kwei, L. (2016) A Mammometric Comparison of Modified Robertson versus Wise Pattern Inferior Pedicle Reduction Mammoplasty. *Plastic and Aesthetic Research*, **3**, 284.
<https://doi.org/10.20517/2347-9264.2016.48>
- [5] Kim, Y., Hwang, K., Kim, H., Kim, T. and Kim, H. (2017) Central Pedicle Reduction Mammoplasty with a Vertical Scar: A Technical Modification. *Journal of Plastic Surgery and Hand Surgery*, **51**, 436-445.
<https://doi.org/10.1080/2000656X.2017.1305390>
- [6] Bilgen, F., Ural, A. and Bekercioglu, M. (2019) Inferior and Central Mound Pedicle Breast Reduction in Gigantomastia: A Safe Alternative? *Journal of Investigative Surgery*, **34**, 401-407. <https://doi.org/10.1080/08941939.2019.1648609>
- [7] Eskitascioglu, T. and Yontar, Y. (2019) Our Experiences Regarding Combined Use of Pedicle Placation and Dermal Flap Suspension in Inferior Pedicle Inverted-T Scar Reduction Mammoplasty. *Cumhuriyet Medical Journal*, **41**, 611-619.
<https://doi.org/10.7197/cmj.vi.617002>
- [8] Erfon, J., Rodrigues, M. and Markovic, A. (2019) Breast Reduction: 33 Years Using a Single Central Block. *Aesthetic Plastic Surgery*, **43**, 1480-1488.
<https://doi.org/10.1007/s00266-019-01503-5>
- [9] Nicholson, S., Khan, M. and Riaz, M. (2018) Technical Refinements of the Modified Central Mound Breast Reduction. *Plastic and Aesthetic Research*, **5**, 34.
<https://doi.org/10.20517/2347-9264.2018.30>
- [10] Bayramicli, M. (2012) The Central Pillar Technique: A New Septum-Based Pedicle Design for Reduction Mammoplasty. *Aesthetic Surgery Journal*, **32**, 578-590.
<https://doi.org/10.1177/1090820X12448657>
- [11] Wolter, A., Fertsch, S., Munder, B., Stambera, P., Schulz, T., Hagouan, M., Janku, D., Staemmler, K., Grueter, L., Abdallah, A., Becker, K., Aufmesser, B., Andree, C. and Kornetka, J. (2021) Double-Unit Superomedio-Central (DUS) Pedicle Inverted-T Reduction Mammoplasty in Gigantomastia: A 7-Year Single-Center Re-

- trospective Study. *Aesthetic Plastic Surgery*, **45**, 2061-2074.
<https://doi.org/10.1007/s00266-021-02351-y>
- [12] Movassaghi, K., Liao, C., Ting, V., Matros, E., Morris, D., Orgill, P. and Pribaz, J. (2006) Eliminating the Vertical Scar in Breast Reduction-Boston Modification of the Robertson Technique. *Aesthetic Surgery Journal*, **26**, 687-696.
<https://doi.org/10.1016/j.asj.2006.10.010>
- [13] Wechselberger, G., Stob, S., Schoeller, T., Oehlbauer, M. and Piza-Katzer, H. (2001) An Analysis of Breast Sensation Following Inferior Pedicle Mammoplasty and the Effect of the Volume of Resected Tissue. *Aesthetic Plastic Surgery*, **25**, 443-336.
<https://doi.org/10.1007/s002660010156>
- [14] Shod, A. (2021) Inferior Pedicle with Inverted-T Procedure for Bilateral Reduction Mammoplasty Provided Satisfactory Surgical and Aesthetic Outcome. *International Surgery Journal*, **8**, 807-815. <https://doi.org/10.18203/2349-2902.isj20210910>
- [15] Al-Boudi, S. and Alhassanieh, A. (2021) Two Crossed Dermal Flaps for Prevention of Bottoming out after Breast Reduction. *Modern Plastic Surgery*, **11**, 71-78.
<https://doi.org/10.4236/mps.2021.114009>
- [16] Weichman, E., Urbinelli, L., Disa, J. and Mehrara, J. (2014) Breast Reduction in Patients with Prior Breast Irradiation: Outcomes Using a Central Mound Technique. *Plastic Reconstruction Surgery*, **135**, 1276-1282.
<https://doi.org/10.1097/PRS.0000000000001147>
- [17] Kemaloglu, C. and Ozacak, H. (2018) Comparative Outcomes of Inferior Pedicle and Superomedial Pedicle Technique with Wise Pattern Reduction in Gigantomastic Patients. *Annals of Plastic Surgery*, **80**, 217-222.
<https://doi.org/10.1097/SAP.0000000000001231>
- [18] Sapino, G., Haselbach, D., Watfa, W., Baudoin, J., Martineau, J., Guillier, D. and Summa, P. (2021) Evaluation of Long-Term Breast Shape in Inferior versus Superomedial Pedicle Reduction Mammoplasty: A Comparative Study. *Gland Surgery*, **10**, 1018-1028. <https://doi.org/10.21037/gs-20-440>
- [19] Makboul, M., Abdelhamid, M. and Al-Attar, G. (2017) Long Term Follow Up and Patient Satisfaction after Reduction Mammoplasty: Superomedial versus Inferior Pedicle. *World Journal of Plastic Surgery*, **6**, 82-87.
- [20] Denewer, A., Hussein, O., Elnahas, W. and Khater, A. (2013) Evaluation of Inferior Pedicle Therapeutic Mammoplasty as a Primary Procedure for Upper Quadrants Early Breast Cancer. *Advances in Breast Cancer Research*, **2**, 86-90.
<https://doi.org/10.4236/abcr.2013.23015>
- [21] Cammarota, M., Filho, J., Daher, J., Neto, A., Faria, C., Borgatto, M., Esteves, B. and Curado, D. (2014) Aesthetic and Reconstructive Application of Mammoplasty with Inferior Dermal Pedicle Technique. *Brazilian Journal of Plastic Surgery*, **29**, 237-242.
<https://doi.org/10.5935/2177-1235.2014RBCP0044>
- [22] Al-Mahmoudy, N. and Reyad, A. (2019) Optimizing the Aesthetic Outcome of Short Scar Periareolar Inferior Pedicle Reduction Mammoplasty. *The Egyptian Journal of Plastic and Reconstructive Surgery*, **43**, 307-312.
<https://doi.org/10.21608/ejprs.2019.65101>
- [23] Mandrekas, A.D., Zambacos, J., Anastasopoulos, A. and Hapas, A. (1996) Reduction Mammoplasty with the Inferior Pedicle Technique: Early and Late Complications in 371 Patients. *British Journal of Plastic Surgery*, **49**, 442-446.
[https://doi.org/10.1016/S0007-1226\(96\)90027-2](https://doi.org/10.1016/S0007-1226(96)90027-2)
- [24] Elsabbagh, H. and Zayed, E. (2018) Assessment of Inferior Pedicle Technique for Large and Ptotic Breasts. *Journal of Plastic Reconstructive Surgery*, **42**, 159-169.

- <https://doi.org/10.21608/ejprs.2018.215082>
- [25] Filho, E., Almeida, G., Arruda, A., Kracik, A., Oliveira, G., Costa, G. and Tuluche (2014) Breast Reduction with Lower Pedicle Technique: An Observational Study. *Brazilian Journal of Plastic Surgery*, **29**, 525-530. <https://doi.org/10.5935/2177-1235.2014RBBCP0092>
 - [26] Jozsef, Z., Ujhelyi, M., Ping, O., Domjan, S., Fulop, R., Ivady, G., Tisler, R., Rubovszky, G., Meszaros, N., Kenessey, I. and Matrai, Z. (2021) Long-Term Dynamic Changes in Cosmetic Outcomes and Patient Satisfaction after Implant-Based Post-mastectomy Breast Reconstruction and Contralateral Mastopexy with or without an Ultrapro Mesh Sling Used for Inner Bra Technique. A Retrospective Correlational Study. *Cancers*, **13**, 73. <https://doi.org/10.3390/cancers13010073>
 - [27] Cho, B., Yang, J. and Baik, B. (2008) Periareolar Reduction Mammoplasty Using an Inferior Dermal Pedicle or a Central Pedicle. *Journal of Plastic, Reconstructive and Aesthetic Surgery*, **61**, 275-281. <https://doi.org/10.1016/j.bjps.2007.10.024>
 - [28] Savaci, N. (1996) Reduction Mammoplasty by Central Pedicle, Avoiding a Vertical Scar. *Aesthetic Plastic Surgery*, **20**, 171-175. <https://doi.org/10.1007/BF02275538>
 - [29] Shin, K., Chung, S., Lee, H. and Lew, J. (1996) Reduction Mammoplasty by Central Pedicle Flap with Short Submammary Scar. *Aesthetic Plastic Surgery*, **20**, 69-76. <https://doi.org/10.1007/BF02275580>
 - [30] Oliveira, L. (2016) Retrospective Analysis of a Personal Casuistry in Reduction Mammoplasty Using the Inferior Pedicle Technique for Various Indications. *Brazilian Journal of Plastic Surgery*, **31**, 321-327. <https://doi.org/10.5935/2177-1235.2016RBBCP0054>
 - [31] Widegrow, D. (2005) Breast Reduction with Inferior Pedicle Fascial Suspension. *Aesthetic Plastic Surgery*, **29**, 532-537. <https://doi.org/10.1007/s00266-004-0119-0>
 - [32] Copcu, E. (2009) A Versatile Breast Reduction Technique: Conical Plicated Central U Shaped (COPCUs) Mammoplasty. *Annals of Surgical Innovation and Research*, **3**, 7. <https://doi.org/10.1186/1750-1164-3-7>
 - [33] Echo, A., Weathers, W. and Wolfswinkel, M. (2014) No Vertical Scar Inferior Pedicle Breast Reduction Using the Dermal Suspension Sling. *European Journal of Plastic Surgery*, **37**, 21-28. <https://doi.org/10.1007/s00238-013-0868-6>
 - [34] Samy, A., Rahman, E.T., Osman, G., Ahmed, M., Mohamed, R.M., Shady, A. and Elsaid, M.K. (2021) Value of Triplicated Inferior Pedicle Breast Reduction in Improving Cosmetic Outcome in Upper Outer Quadrant Breast Cancer Patients. *The Medical Journal of Cairo University*, **89**, 1575-1583. <https://doi.org/10.21608/mjcu.2021.194974>
 - [35] Abbate, A., Fan, K. and Nahabedian, Y. (2017) Central Mound Mastopexy for the Correction of Tuberous/Tubular Breast Deformity. *PRS Global Open*, **5**, E1545. <https://doi.org/10.1097/GOX.0000000000001545>
 - [36] Swanson, E. (2021) A Review and Measurement Study of the Central Mound Pedicle for Breast Reduction. *Plastic and Reconstructive Survey-Global Open*, **9**, e3615. <https://doi.org/10.1097/GOX.0000000000003615>
 - [37] Delong, M., Chang, I., Frajzadeh, Nahabet, E., Roostaeian, J., Festekjian, J., Rough, J. and Lio, A. (2020) The Central Mound Pedicle: A Safe and Effective Technique for Reduction Mammoplasty. *Plastic and Reconstructive Strategy*, **146**, 725-733. <https://doi.org/10.1097/PRS.00000000000007173>
 - [38] Bustos, S., Molinar, V., Kuruoglu, D., Cespedes-Gomez, O., Sharaf, A., Martinez-Jorge, J., Manrique, J., Tran, V. and Nguyen, T. (2020) Inferior Pedicle Breast Reduction and Long Nipple-to-Inframammary Fold Distance: How Long Is Safe?

Journal of Plastic, Reconstructive and Aesthetic Surgery, **74**, 495-503.

<https://doi.org/10.1016/j.bjps.2020.08.123>

- [39] Aggarwal, S., Marla, S., Nyanhongo, D., Kotecha, S. and Basu, N. (2015) Current Practice of Therapeutic Mammoplasty: A Survey of Oncoplastic Breast Surgeons in England. *International Journal of Surgical Oncology*, **2016**, Article ID: 1947876. <https://doi.org/10.1155/2016/1947876>
- [40] Yvorchuk, W. (1999) Central Pedicle Breast Reduction. *The American Journal of Cosmetic Surgery*, **16**, 49-58. <https://doi.org/10.1177/074880689901600110>

Upper Footprint Dependent Nipple Position to Avoid High-Riding Nipple after Reduction Mammoplasty

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Abstract

Introduction: High-riding nipple following reduction mammoplasty is a challenging problem for the plastic surgeons. To avoid such problem, many methods have been described for marking the correct nipple position but still controversial. We aimed in this study to present our experience in preventing excessive nipple elevation after reduction mammoplasty by using the upper footprint to set the new nipple position. **Material and Methods:** From March 2019 to March 2022, 25 female patients at a mean age of 38.3 years were included in this prospective study. They underwent reduction mammoplasty with inverted T scar and a combination of inferior pedicle and Würinger's septum techniques. Resection weights, pre- and postoperative anthropometric measures were recorded. All patients were photographed at the follow-up visits and evaluated for complications if any, the nipple-areola complex (NAC) sensation, and subjective patient satisfaction using "The Breast Evaluation Questionnaire". **Results:** The mean preoperative midclavicular point to nipple distance was 37.40 and 37.18 cm for the right and left breasts, respectively. The mean resection weight was 1270 and 1242 g from the right and left sides, respectively. None of our patients experienced NAC necrosis, while 2 breasts had minor wound dehiscence treated conservatively. After a mean follow-up period of 12 months, the NAC descended by an average of 1.40 cm, the distance from the IMF to nipple had an average increase of 2.24 cm, and all of patients were satisfied with the esthetic outcomes and convinced with their breast shape. **Conclusion:** The upper footprint dependent nipple position seems to have a real role in preventing high-riding nipple after breast reduction in hypertrophic and gigantomastic breasts. Moreover, it can be applied easily and allow for more satisfying outcomes than other methods for setting the new nipple position.

Keywords

High-Riding Nipple, Breast Footprint, Reduction Mammoplasty

1. Introduction

The high-riding nipple (HRN) following mastopexy or breast reduction could be a real problem for the plastic surgeons [1]. In its milder presentations; it causes upturned nipples located above the equator of the breast and above the most projected point. This mild form is often overlooked. Nevertheless, in its more severe forms, it is very embarrassing and disfiguring [2]. The foremost important lesson for its treatment is that prevention is the way easier than the correction. Achieving this goal, the site for new nipple position, requires careful planning during breast reduction surgery to ensure that the nipple-areola complex (NAC) is eventually situated at or near the most projected region of the breast, regardless of the chosen pedicle or skin pattern [3].

However, fixed ideal measurements have inherent limitations as they can vary with factors such as torso width, height and proportions, and the breast footprint [4]. The breast footprint is the outline made by the breast on the chest wall. Importantly, the breast footprint will never change in the same woman either in dimensions or in position after puberty. When the breast enlarges because of weight gain or hormonal influences, the breast will never grow over the midline, the midaxillary line, the inframammary crease, or up to the clavicle [5].

Due to the true potential of NAC displacement, the inframammary fold (IMF) transposition continues to prove to be the most widely used method for selecting new nipple positions [6]; however, this method can be problematic in the setting of gigantomastia or severely ptotic breasts [7]. Instead, Spear and Albino [8] said that the determining factor for the position of the new nipple, should be the upper breast border “upper footprint”, not some arbitrary number from the mid-clavicular point or the suprasternal notch. They found that there was sufficient skin in sufficiently large breasts of at least 8 cm (usually 10 cm) from the upper edge of the breast to the upper edge of the planned new areola window. We aimed in this study to present our experience in preventing excessive nipple elevation after reduction mammoplasty by using the upper footprint to set the new nipple position.

2. Materials and Methods

This prospective study included 25 female patients (50 breasts) who underwent reduction mammoplasty, for breast hypertrophy, by a senior author between March 2019 and March 2022 at Plastic Surgery Department, Tanta University Hospitals. The study was approved by the University Ethical Committee. All patients signed an informed written consent before surgery and medical photography. The inclusion criteria were no previous breast surgeries or diseases and

patients with constant body weights (not more than ± 1000 g) during the course of the study. Those with uncontrolled hypertension, coagulopathies and those with NAC complexes < 30 cm from the midclavicular point were excluded from the study. All cases were operated on with inverted T scar and a combination of inferior pedicle and Würinger's horizontal septum techniques as adopted in our institute. Breast anthropometric measures; midclavicular point to nipple distance and IMF to nipple distance were recorded. The data gathered for statistical analysis were presented as means and standard deviations. The mean age of the patients was 38.32 ± 5.07 (range 33 - 50) years. The mean body mass index BMI was 32.51 ± 2.15 (range 28 - 35) kg/m^2 . Patient data are summarized in (**Table 1**).

2.1. Preoperative Marking

Markings were made preoperatively with the patients in a standing upright position. Breast meridian, midline, IMF, and upper breast border were marked. The neo-NAC position was located on the midclavicular line where the distance between the highest point of the new areola window and the upper breast border was 8 cm (**Figure 1**). The original areola was marked 4 - 5 cm in diameter. The inferior pedicle was marked on the IMF at 8 cm, and all patients were marked according to the inverted T scar pattern.

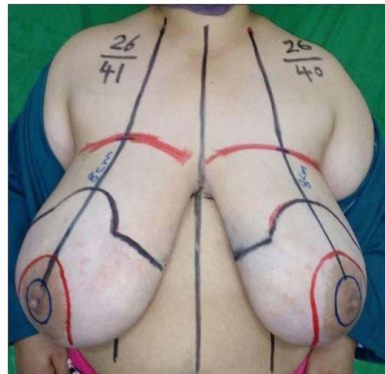


Figure 1. Preoperative marking.

Table 1. Patient data.

No of patients	25 (50 breasts)
Age (years)	38.32 ± 5.07
BMI (kg/m^2)	32.51 ± 2.15
Resection weight (grams) (right-left)	1270 ± 396 1242 ± 430
Complications NAC complications	0% (0 breasts)
Hematoma	0% (0 breasts)
Minor wound dehiscence	4% (2 breasts)
Follow-up (months)	12 ± 3.46

2.2. Surgical Technique

Under general anesthesia, incision lines were infiltrated with 1:1.000.000 adrenaline infiltration. De-epithelialization of the pedicle was done at 1st, and then tissue resection was executed from the medial side down to the muscular fascia to superior direction. After completing medial resection of the breast tissue, the Würinger's horizontal septum could be identified easily at the level of the 5th rib. The breast tissue could be separated easily at this level into its cranial and caudal parts, as it is an avascular plane. The resection was continued in the lateral to superior direction. After that the pedicle was folded and fixed to the pectoral fascia at the 2nd intercostal space with 2/0 non-absorbable sutures superiorly, medially, and laterally. The neo-NAC was placed in the planned area and the arms of the T pattern were approximated with guide sutures. The other side was done in the same manner. Suction drains were placed, and the skin was closed appropriately. Light dressings were used and the standard bra without wire was fitted for 2 months. The drains were removed on the 4th postoperative day and the patients were discharged. The sutures were removed after 10 - 14 days. Follow-up visits were arranged monthly for three months, then every three months for two years. All patients were photographed at the follow-up visits and evaluated for the healing process, complications if any, NAC sensation, the new set of anthropometric measures, and the general appearance of the breast using "The Breast Evaluation Questionnaire" to assess subjective patient satisfaction.

3. Results

Over a 3-year period, fifty hypertrophic breasts were treated by reduction mammoplasty. The mean preoperative midclavicular point to nipple distance was 37.40 ± 3.55 and 37.18 ± 3.36 cm for the right and left breasts, respectively. The mean preoperative IMF to nipple distance was 19.36 ± 2.85 and 19.05 ± 2.60 cm for the right and left sides, respectively. The mean resection weight was 1270 ± 396 and 1242 ± 430 g from the right and left breasts, respectively, with 16 cases having more than 1000 g resection weight per side. None of our patients experienced NAC necrosis, while 2 cases (2 breasts) had minor wound dehiscence at the T junction and they were treated conservatively with good healing.

The mean immediate postoperative midclavicular point to nipple distance was 24.12 ± 2.16 cm and the mean immediate postoperative IMF to nipple distance was 8.58 ± 0.56 cm. After a mean follow-up period of 12 ± 3.46 (range 9 - 18) months, the mean midclavicular point to nipple distance was 25.65 ± 2.05 and 25.38 ± 2.19 cm for the right and left breasts, respectively, and the mean IMF to nipple distance was 10.91 ± 0.52 and 10.73 ± 0.54 cm for the right and left sides, respectively (**Table 2**). According to these measurements, the distance from the IMF to nipple had an average increase of 2.24 cm, and the NAC descended by an average of 1.40 cm. NAC sensation was maintained in all of our patients. None of our cases complained about their breast final shape and all of them were satisfied with the esthetic outcomes (**Figure 2** and **Figure 3**).



Figure 2. Preoperative, 1 month postoperative and 1 year postoperative pictures showing good esthetic outcomes with the nipples at the point of highest projection.



Figure 3. Preoperative, 1 month postoperative and 1 year postoperative pictures (lateral view) showing good esthetic outcomes with the nipples at the point of highest projection.

Table 2. Preoperative and postoperative measurements.

	Right	Left
Preoperative midclavicular - nipple distance (cm)	37.40 ± 3.55	37.18 ± 3.36
Preoperative IMF - nipple distance (cm)	19.36 ± 2.85	19.05 ± 2.60
Postoperative midclavicular - nipple distance (cm)		
Immediate	24.12 ± 2.16	24.12 ± 2.16
Late	25.65 ± 2.05	25.38 ± 2.19
Postoperative IMF - nipple distance (cm)		
Immediate	8.58 ± 0.56	8.58 ± 0.56
Late	10.91 ± 0.52	10.73 ± 0.54

4. Discussion

The power of femininity is reflected in the beauty of the breasts. The nipple-areola complex is the most functional and esthetic part of the breast [5]. Breast reduction is routinely designed to reduce excess glandular tissue, reposition the NAC, remodel the mammary complex and resect excess skin with different incisions and scars [9] but often may result in too high nipple position that, appears elevated more than the anticipated in the preoperative design, gives the breasts a grotesque appearance and can only be treated through complicated surgical techniques [8]. To avoid such problem, it is critical to properly mark the nipple position taking into consideration the cranialization of the NAC postoperatively [4].

Due to personal differences in physical features, nipple position based on ideal suprasternal notch-to-nipple distance (18 - 23 cm) is only meaningful for orientation, but the predictable site of nipples must in any case be determined by individual measurements [10]. There are several ways for marking the new nipple position. The finger test is commonly used in which the 4 fingers are placed behind the breast in the IMF, and the middle finger opposite to the thumb, shows the expected position of the nipple. Lassus [6] placed the upper edge of the areola 2 cm below the midway between the acromion and olecranon in the standing position. Hall-Findlay [11] put a measuring tape under the breast and marked the level of the IMF on the midline of the chest. 2 cm below this point marks the new nipple position. Akyurek marked the new nipple position at a point below the IMF by the amount of upper pole descent [12]. In this study, we aimed to present our experience in preventing high-riding nipple after reduction mammoplasty by using the upper footprint to set the new nipple position. We marked the upper edge of the neo-NAC on the breast meridian at 8 cm below the upper breast border, with the new nipple position 2 - 2.5 cm below the superior border of the areola.

In the present study, we preferred to use a combination of inferior pedicle and Würinger's horizontal septum technique with the inverted T scar pattern as adopted in our institute for large-volume reduction mammoplasty patients. The inferior pedicle method is still the most popular reduction mammoplasty technique used today that is safe, can be applied easily, has a short learning curve, and preserves sensitivity and vascularity of the NAC. Although the inferior pedicle is safe, poor circulation of the NAC may occur due to long pedicle in large-volume breast reductions. Accordingly, preserving Würinger's horizontal septum with the pedicle provides two vascular systems, increase the chance of NAC viability and warrant resection of large amount of tissue to relieve the patients' symptoms. In our study, the mean resection weight was 1270 ± 396 and 1242 ± 430 g from the right and left breasts, respectively, and none of our cases had NAC necrosis, while 2 breasts (4%) had minor wound dehiscence. In a similar study, Kelahmetoglu *et al.* [13] used Würinger's septum and inferior pedicle techniques for 120 breast reductions. The mean resection weight was 1406 ± 566 and 1340 ± 563 g from the right and left sides, respectively. They encountered no cases of total NAC necrosis, 1 case of partial NAC necrosis and 5 cases (8.3%) of venous insufficiency. They concluded that the combined method promote more satisfying and safer results than the inferior pedicle method alone. In another study, Portincasa *et al.* [14] compared the inferocentral pedicle including Würinger's septum with the inferior pedicle technique and reported significant decrease in the incidence of the NAC complications in the inferocentral pedicle technique.

In our study, the pedicle was suspended to the pectoral fascia with non-absorbable sutures in order to prevent the bottoming out which is a common drawback of the inferior pedicle technique. We noticed that after a mean follow up of 12 months, none of our patients complained of this deformity and

all of them were pleased about their breast shape. Pennington [15] performed pedicle suspension and plication to prevent bottoming out in 500 cases and reported that all patients were satisfied with their breasts and none of them complained from pseudoptosis or bottoming out. Nevertheless, it is not always possible to prevent bottoming out over long periods of time due to breast parenchyma natural descent by the effect of gravity.

In the current study, we used the upper footprint to set the new nipple position. We found that after an a mean of 1 year follow up, the NAC descended by an average of 1.40 cm, the distance from the IMF to nipple had an average increase of 2.24 cm, and all of patients were satisfied with the esthetic outcomes and convinced with their breast shape. In another study, Altuntas *et al.* [3] used the finger test to mark the nipple position on the IMF. They observed that the NAC descended by an average of 1.7 cm and the IMF to nipple had an average increase of 3.45 cm, leading to apparent superior nipple displacement of $(3.45 - 1.7 = 1.75 \text{ cm})$. They recommended that the new nipple position ought to be marked at 1.5 to 1.75 cm below the point of maximal projection of the breast intraoperatively. Gulyás [10] used the method of breast parenchyma dynamic imbrication to reveal the most projected area on the breast meridian, indicating the new nipple position. They reported this method is only applicable for small to medium reductions, while for large-volume reductions should be controlled with the methods using fixed anatomical reference points such as the IMF or the upper breast border. Finally, this study was limited by the relatively few number of cases and the short term follow up. Considerably, further studies on a larger number of cases with longer follow-up periods are therefore recommended for better assessment of this technique.

5. Conclusion

In conclusion, upper footprint dependent nipple position seems to have a real role in preventing high-riding nipple after breast reduction in hypertrophic and gigantomastic breasts. Moreover, it can be applied easily and allow for more satisfying outcomes than other methods for setting the new nipple position.

Conflicts of Interest

This article is original not submitted or accepted for publication elsewhere; there is no conflict of interests.

References

- [1] Colwell, A.S., May Jr., J.W. and Slavin, S.A. (2007) Lowering the Postoperative High-Riding Nipple. *Plastic and Reconstructive Surgery*, **120**, 596-599. <https://doi.org/10.1097/01.prs.0000270283.64971.dd>
- [2] Frenkiel, B.A., Pacifico, M.D., Ritz, M. and Southwick, G. (2010) A Solution to the High-Riding Nipple-Areola Complex. *Aesthetic Plastic Surgery*, **34**, 525-527. <https://doi.org/10.1007/s00266-009-9421-1>
- [3] Altuntaş, Z.K., Kamburoğlu, H.O., Yavuz, N., Dadacı, M. and İnce, B. (2015)

- Long-Term Changes in Nipple-Areolar Complex Position and Inferior Pole Length in Superomedial Pedicle Inverted “t” Scar Reduction Mammoplasty. *Aesthetic Plastic Surgery*, **39**, 325-330. <https://doi.org/10.1007/s00266-015-0470-3>
- [4] Lewin, R., Widmark-Jensen, E., Plate, N. and Hansson, E. (2018) Objective Evaluation of Nipple Position after 336 Breast Reductions. *Journal of Plastic Surgery and Hand Surgery*, **52**, 198-203. <https://doi.org/10.1080/2000656X.2017.1419142>
- [5] Blondeel, P.N., Hijjawi, J., Depypere, H., Roche, N. and Van Landuyt, K. (2009) Shaping the Breast in Aesthetic and Reconstructive Breast Surgery: An Easy Three-Step Principle. *Plastic and Reconstructive Surgery*, **123**, 455-462. <https://doi.org/10.1097/PRS.0b013e3181954cc1>
- [6] Lassus, C. and Hidalgo, D.A. (1999) Update on Vertical Mammoplasty. *Plastic and Reconstructive Surgery*, **104**, 2303-2304. <https://doi.org/10.1097/00006534-199912000-00062>
- [7] Ahmad, J. and Lista, F. (2008) Vertical Scar Reduction Mammoplasty: The Fate of Nipple-Areola Complex Position and Inferior Pole Length. *Plastic and Reconstructive Surgery*, **121**, 1084-1091. <https://doi.org/10.1097/01.prs.0000302453.26842.5d>
- [8] Spear, S.L. and Albino, F.P. (2016) Management of the High-Riding Nipple after Breast Reduction. *Clinics in Plastic Surgery*, **43**, 395-401. <https://doi.org/10.1016/j.cps.2015.12.008>
- [9] Souza, A.A., Faiwchow, L., Ferreira, Á.D.A., Simão, T.S., Pitol, D.N. and Máximo, F.R. (2011) Comparative Analysis of Mammoplasty Techniques Based on the Long-Term Effect on the Nipple-Areolar-Complex to Inframammary Crease Distance. *Revista Brasileira de Cirurgia Plástica*, **26**, 664-669. <https://doi.org/10.1590/S1983-51752011000400022>
- [10] Gulyás, G. (2004) Marking the Position of the Nipple-Areola Complex for Mastopexy and Breast Reduction Surgery. *Plastic and Reconstructive Surgery*, **113**, 2085-2090. <https://doi.org/10.1097/01.PRS.0000122404.10073.55>
- [11] Hall-Findlay, E.J. (2004) Vertical Breast Reduction. *Seminars in Plastic Surgery*, **18**, 211-224. <https://doi.org/10.1055/s-2004-831908>
- [12] Akyurek, M. (2011) Contouring the Inferior Pole of the Breast in Vertical Mammoplasty: Suction-Assisted Lipectomy versus Direct Defatting. *Plastic and Reconstructive Surgery*, **127**, 1314-1322. <https://doi.org/10.1097/PRS.0b013e318205f441>
- [13] Kelahmetoglu, O., Firinciogullari, R., Yagmur, C., Yildiz, K. and Guneren, E. (2017) Combination of Würinger's Horizontal Septum and Inferior Pedicle Techniques to Increase Nipple-Areolar Complex Viability during Breast Reduction Surgery. *Aesthetic Plastic Surgery*, **41**, 1311-1317. <https://doi.org/10.1007/s00266-017-0933-9>
- [14] Portincasa, A., Ciancio, F., Cagiano, L., Innocenti, A. and Parisi, D. (2017) Septum-Enhanced Mammoplasty in Inferocentral Pedicled Breast Reduction for Macromastia and Gigantomastia Patients. *Aesthetic Plastic Surgery*, **41**, 1037-1044. <https://doi.org/10.1007/s00266-017-0868-1>
- [15] Pennington, D.G. (2006) Improving the Results of Inferior Pedicle Breast Reduction Using Pedicle Suspension and Plication. *Aesthetic Plastic Surgery*, **30**, 390-394. <https://doi.org/10.1007/s00266-006-0040-9>

Acute Fingertip Injuries in Sudanese Patients: Patterns and Clinical Presentation

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Abstract

Background: Acute fingertip injuries are common and may lead to functional and aesthetic complications if not treated properly. Different types of trauma result in injuries with variable severity and affect certain risk groups. **Objectives:** To study the high-risk groups affected by fingertip injuries, their etiological factors, clinical features, and wound patterns, and the influence of hand dominance. **Study Design:** A descriptive study of 103 consecutive patients with 144 acutely injured fingertips. **Data Collection/Analysis:** We obtained demographic data, occupation, hand dominance, time and cause of trauma, and the presenting symptoms. Further, clinical examination, radiological, and laboratory studies were performed. Wound characteristics were classified according to the pulp, nailbed and bone (PNB) classification. The data were analyzed with the Fisher's exact test and Chi-square test. **Results:** A total of 103 patients (88 males, 15 females) presented with 144 injured fingertips. The male to female ratio was 5.8:1, and the mean age was 27.5 years. The age group affected most commonly was 16 - 20 years. There was a strong association between hand dominance and fingertip injuries, as in 65% of the cases, the dominant hand was injured more frequently than the non-dominant ($p = 0.01$). The sharp and blunt injuries observed involved the left hand more than the right and were often the result of machinery-related trauma ($p = 0.04$). Approximately 68% of the injuries were related to work, while 26% were attributable to domestic accidents. In 22% of the cases, seasonal workers were the category affected most often, followed by factory workers. Nearly half of the injuries were related to working with machines, while door-trapping was the most frequent cause of injury in children under 5. The index finger was injured most frequently (31.9%), followed by the middle finger (27.9%), while the thumb and little fingers were involved least (11% for each). Pulp injuries

were seen in 97% of cases, commonly with lacerations (39.6%, $n = 139$) while complete pulp loss was seen in 12.6% of cases. 87% of the cases were nail bed injuries, often with nail bed lacerations (28.6%, $n = 126$), while complete nail bed loss was observed in 9.5% of cases. Tuft fractures were the commonest bone injuries (26%), while complete bone loss was seen in 7.7% of the injured bones ($n = 104$). Conservative management was carried out on 9% of fingers, while the others required various methods of surgical repair. Nail bed repair was performed in 48.8% of cases ($n = 126$), while bone fixation was required in 20.2% ($n = 104$). **Conclusions:** Fingertip injuries are highly common in practice. In our study, the age, gender, mechanism of trauma and hand dominance had their influence on the pattern of injury. Finally, wound characteristics determine the type of management required.

Keywords

Fingertip, Pulp, Nailbed

1. Introduction

Many factors influence the outcome of treating fingertip injuries, such as patient age, sex, occupation, hobbies, hand dominance, pre-existing medical conditions, and the fingertip injury's anatomy. These injuries must be treated to preserve length, function, and sensation, as well as to ensure an acceptable appearance [1]. One-third of all traumatic injuries affect the hands [2], and the fingertips are the portion of the hand injured most frequently. Because it is the most distal and the last finger to be withdrawn, the middle finger is most at risk [3].

2. Classifications

There have been several classifications of fingertip injuries, such as the Allen classification (1980) and the Ishikawa classification (1990) (distal digital amputation levels). These classifications are very simple to use, but they cannot describe the details of an injury.

The PNB Classification

Evans and Bernadis introduced the PNB classification, in which the injury is divided into its effect on the fingertip bone, nail, and pulp, and each component is divided into 7 or 8 items that allow the injuries to be described more precisely. This results in a three-digit number that describes the injury accurately and can be used to document injuries without having to resort to lengthy descriptions. It may also be used as a guide for treatment and indications for referral [4]. In PNB 356 and PNB 455 and 466, surgical treatment is most suitable, and PNB 386 and PNB 666 and 700 indicate the boundary between surgical and conservative treatment [5]. Many controversies exist regarding treatment of the condition, but the management choice relies on the category of injury, the patient's occupa-

tion, hobbies, and cosmetic demands. When it is mandatory to return to manual work early, terminalization is the best treatment, and in certain cases, such as the thumb and index finger, a flap may be preferred based upon its length, sensation, and appearance [6].

Healing by Secondary Intention

- Composite Grafts;
- Revision Amputation;
- Skin Grafts;
- Local Flaps;
- Regional and Distant Flaps;
- Replantation.

3. Objectives of the Study

- 1) To investigate the etiology of acute fingertip injuries in Sudanese patients.
- 2) To determine high risk groups in relation to age, gender, and occupation and compare this with the international literature.
- 3) To study the association between fingertip injuries and hand dominance.
- 4) To evaluate wound characteristics according to the PNB classification, and discuss the options for management available.

4. Patients and Methods

This is a prospective descriptive study performed during a one-year period. The study included a sample of 103 consecutive patients who presented to the Omdurman teaching hospital trauma department with 144 acutely injured fingertips (88 males, 15 females, mean age of 27.5, SD = 15.5, age range = 1.2 - 88, **Figure 1**), and injuries of more than 16 hours' duration were excluded. Initially, a comprehensive history was recorded for each patient. The participants were consented and completed a questionnaire on age, sex, contact numbers, occupation,

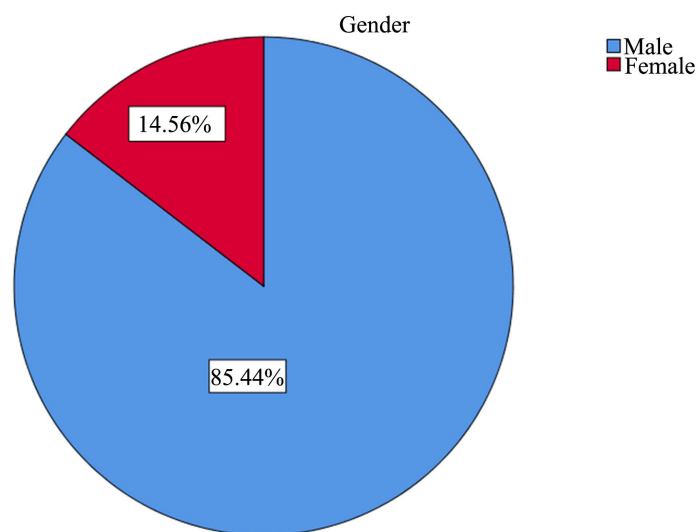


Figure 1. Gender distribution.

hand dominance, presenting symptoms, and mode of trauma. A thorough physical examination and plain X-ray findings were recorded. Wounds were assessed using the PNB classification. Data were analyzed using SPSS v.25. The Chi-square test was used, and a p -value of 0.05 or less was considered significant.

5. Results

Males were affected six times more than females (**Figure 1**). The age group in the patient population affected most commonly was 16 - 20 years (20.4% of cases), followed by 31 - 35 years (15.5%), and 21 - 25 years (11%). Children younger than 5 years constituted 11% of the total study population. Based upon the occupation analysis, seasonal and factory workers were injured most commonly, 29% and 22%, respectively. Dominant hand injuries were most common and were seen in 65% of the cases (**Table 1**).

The result of the Fisher exact test was significant at $p = 0.0004$ and showed a strong association between hand dominance and trauma. The most commonly observed injuries were related to machine use (**Figure 2**). Sharp and blunt injuries were observed that involved the left hand, while the predominant injuries of the right hand were attributable to machinery-related trauma (**Table 2**). Most patients presented with pain, while 73% presented with bleeding, and 38% had tissue loss. Fifty percent of patients presented within 2 hours after the trauma while 29.9% were seen 2 - 4 hours following injury. Four percent presented more than 12 hours after the time of trauma.

With respect to the trauma environment, 68% of the injuries occurred at work, and 26.2% at home. The remaining accidents occurred on the road or in school. Half of the injuries were attributable to machinery use and 25% were caused by blunt trauma. Injuries with sharp objects constituted 18.4%. Door-trapping was the commonest injury in children under 5 years (**Table 3**).

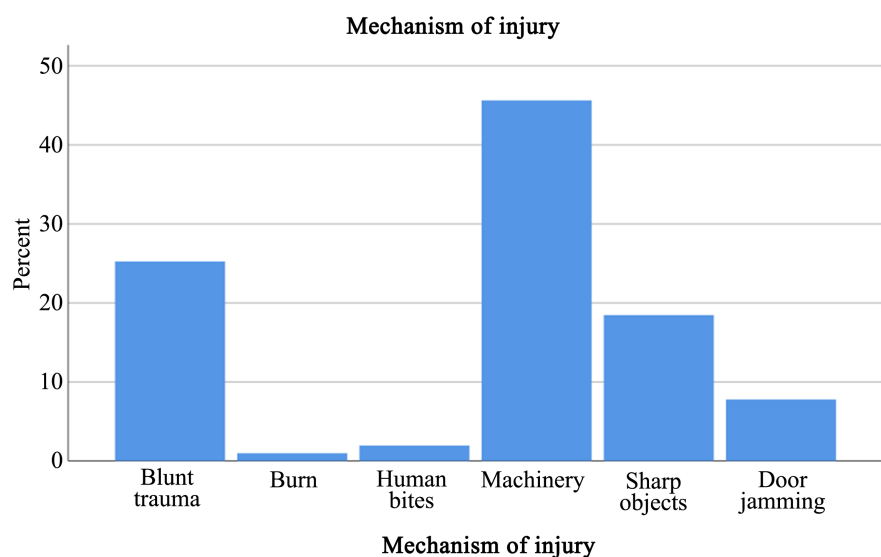


Figure 2. The mechanisms of trauma.

Table 1. The association between hand dominance and injury.

		Hand Dominance			Total
		Left-handed	Ambidextrous	Right-handed	
Affected hand	Left	12	1	33	46
	Right	1	3	53	57
Total		13	4	86	103

$p = 0.001$.

Table 2. Mechanisms of trauma in relation to the affected hand.

		Cause of trauma						Total
		Blunt trauma	Burn	Door jamming	Human bite	Machine	Sharp object	
Affected hand	Left	14	0	1	0	19	12	46
	Right	12	1	7	2	28	7	57
Total		26	1	8	2	47	19	103

$p = 0.04$.

Table 3. The mechanisms of injury in relation to environment of trauma.

		Environment in which injury occurred				Total
		Work	Street	Home	School	
Cause of trauma	Blunt	14	3	8	1	26
	Burn	0	0	1	0	1
	Door jamming	1	0	7	0	8
	Human bite	0	0	2	0	2
	Machinery	43	0	4	0	47
	Sharp object	13	1	5	0	19
	Total	71	4	27	1	103

$p = 0.019$.

The mechanism of trauma was found to have an impact on the number of fingertips injured, machines and blunt trauma tend to affect more than one digit (**Table 4**).

The index finger was injured most frequently (31.9%). The middle finger sustained 27.1% of the total injuries, while the ring finger sustained 18%. The little fingers and thumb were affected equally (11%). The commonest finger susceptible to machine injury was found to be the middle finger, while the index finger was more prone to blunt trauma (**Table 5**).

Pulp injuries were seen in 97% of the cases and pulp laceration was the com-

monest presentation (39.6%, n = 139), followed by loss of the distal transverse pulp (18.7%). Complete pulp loss was seen in 12.2% of cases (**Table 6**). Nail bed injuries were seen in 87% of all cases. The sterile matrix laceration was the commonest injury, seen in 28.6% of cases (n = 126). Complete loss of the nail bed was observed in 9.5% of the cases (**Table 7**).

Bone injuries were observed in 72% of the cases. Tuft fractures were the most common bone injuries and were seen in 26% of cases (n = 104). Complete bone loss was observed in 7.7% of cases (**Table 8**).

With respect to management, 9% of the cases were treated conservatively, while 91% required various types of surgical repair, ranging from primary repair to skin grafting and tissue flaps (**Table 9**). Nail bed repair was performed on 48.8% of injured nails, while bone fixation was required in only 20.2% of the bones affected.

Table 4. Mechanism of injury * number of fingers involved crosstabulation.

		Count				
		Number of fingers involved				Total
		Single finger	2 fingers	3 fingers	4 fingers	
Mechanism of injury	Blunt trauma	22	3	1	0	26
	Burn	1	0	0	0	1
	Human bites	1	0	1	0	2
	Machinery	25	14	5	3	47
	Sharp objects	15	4	0	0	19
	Door jamming	7	1	0	0	8
Total		71	22	7	3	103

Table 5. Mechanism of injuries related to each fingertip.

Count							
		affected finger					Total
		Index	Little	Middle	Ring	Thumb	
Cause of injury	Blunt object	14	4	8	4	5	35
	Burn	1	0	0	0	0	1
	Door	3	1	2	1	2	9
	Human bite	1	1	0	1	1	4
	Machinery	20	7	24	16	5	72
	Sharp object	7	4	5	4	3	23
Total		46	17	39	26	16	144

Table 6. The frequencies and percentages of pulp injuries.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Laceration	55	39.6	39.6	39.6
	Crush	14	10.1	10.1	49.6
	Loss-distal transverse	26	18.7	18.7	68.3
	Loss-palmar oblique partial	13	9.4	9.4	77.7
	Loss-dorsal oblique	6	4.3	4.3	82.0
	Loss-lateral	8	5.8	5.8	87.8
	Loss-complete	17	12.2	12.2	100.0
	Total	139	100.0	100.0	

Table 7. The frequencies and percentages of Nailbed injuries.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sterile matrix laceration	36	28.6	28.6	28.6
	Germinal, sterile matrix laceration	21	16.7	16.7	45.2
	Crush	15	11.9	11.9	57.1
	Proximal nail bed dislocation	7	5.6	5.6	62.7
	Loss-distal third	21	16.7	16.7	79.4
	Loss-distal two thirds	10	7.9	7.9	87.3
	Loss-lateral	4	3.2	3.2	90.5
	Loss-complete	12	9.5	9.5	100.0
	Total	126	100.0	100.0	

Table 8. The frequencies and percentages of bone injuries.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Tuft fracture	27	26.0	26.0	26.0
	Comminuted non-articular	17	16.3	16.3	42.3
	Articular	6	5.8	5.8	48.1
	Displaced basal	5	4.8	4.8	52.9
	Tip exposure	25	24.0	24.0	76.9
	Loss-distal half	6	5.8	5.8	82.7
	Loss-subtotal	10	9.6	9.6	92.3
	Loss-complete	8	7.7	7.7	100.0
	Total	104	100.0	100.0	

Table 9. Pulp repair options.

	Frequency	Percent	Valid Percent	Cumulative Percent
Primary repair	67	46.5	46.5	46.5
Foucher flap	1	0.7	0.7	47.2
Venkataswamy-Subramanian	2	1.4	1.4	48.6
Kutler flap	5	3.5	3.5	52.1
Palmar v-y flap	22	15.3	15.3	67.4
Valid Skin graft	13	9.0	9.0	76.4
Terminalization	4	2.8	2.8	79.2
Moberg flap	5	3.5	3.5	82.6
Conservative treatment	13	9.0	9.0	91.7
Composite graft	12	8.3	8.3	100.0
Total	144	100.0	100.0	

6. Discussion

Although physicians underestimate the problem of fingertip injuries, it is the patient who pays the price of his unawareness, which is influenced by improper assessment and injudicious management. Despite the fact that hundreds of international publications have studied this problem in detail, the local literature is highly deficient in describing acute fingertip injuries. The male to female ratio in this study was 5.8:1, which is similar to the result in Saeed and Murtada's unpublished study (2005) that estimated the male to female ratio in Sudanese hand trauma patients to be 5:1. Our ratio is higher compared to that in Indian (1.5:1) [1] and Nigerian studies (1.8:1) [7] and much lower compared to a study in the United Arab Emirates (11.5:1) [8]. This reflects cultural issues related to women's work.

The age groups injured most commonly were children (younger than 5) and teenagers (16 - 20). The most frequent injuries in children were attributable to door jamming (54%), which is consistent with the results in Doraiswamy's study [9]. Teenagers were injured frequently at work, which is likely attributable to local economic issues. In the United Arab Emirates, injuries were encountered largely between 25 to 29 years [8]. In our study, we found a higher percentage of job-related finger injuries (68%), which could be related to workers' unawareness and a lack of safety measures. Further, most of the victims were teenagers and non-professional workers.

Injuries caused by machines were found in 45% of our cases, which is similar to Denise and Jerome's study [10].

The dominant hand was reported to be injured in 65% of patients compared to Ihekire and Salawu's study [7], which estimated that dominant hand injuries

were 56.8%. All of these circumstances would alter the individual functional and economic outcome, particularly if the dominant hand is affected.

Treatment options depend greatly upon the surgeon's preference, wound characteristics, and the other factors mentioned above. Primary repair was the most common modality of treatment observed in pulp lacerations. Although flaps have been used often in the literature to treat transverse pulp loss, such as the Atasoy (V. Y. flap) and Kutler flaps that provide sensation and padding of the fingertips, in our study, the Atasoy flap was used in 23 cases with minimal flap loss or hook nail deformities. These types of flaps are simple and can be performed by junior staff. Volar pulp loss has been treated often using a thenar split skin graft and was performed in 13 cases. Cross finger flaps typically compromise the adjacent finger and thenar flaps lead to joint stiffness. This is why they are not commonly used in our practice. Venkataswami's triangular flap was a good choice to treat lateral oblique pulp defects and is used by senior staff for a better outcome, although Gan Muneuchi has challenged this, and argued against the benefit of surgery in trying to achieve any cosmetic results after nail loss [5].

Composite grafts were applied in 12 fingers with acceptable outcomes, particularly in children. Conservative management was adopted in 13 patients based upon their minimal tissue loss. Typically, thumb injuries were treated by simple repair (Moberg or Foucher flaps). Moberg flaps were constructed in 5 cases and were used for distal thumb amputation when it appeared to be impossible to use the V. Y. flap. The Foucher flap, which is based on the first dorsal metacarpal artery and radial nerve branches, was used in one case in the study.

7. Conclusion

Our findings are similar to the previously published article, with minor differences. Safety measures and education are highly recommended to prevent injuries in high-risk groups.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Sanjay, S. and Tiwari, V. (2007) Fingertip Injuries. *India J Orthop*, **41**, 163-168.
- [2] Stewart, A., Biddulph, G. and Firth, G. (2017) The Aetiology of Acute Traumatic Occupational Hand Injuries Seen at a South African State Hospital. *SA Orthopaedic Journal*, **16**, 49-53. <https://doi.org/10.17159/2309-8309/2017/v16n4a8>
- [3] George, A., Alexander, R. and Manju, C. (2017) Management of Nail Bed Injuries Associated with Fingertip Injuries. *Indian Journal of Orthopaedics*, **51**, 709-713. https://doi.org/10.4103/ortho.IJOrtho_231_16
- [4] Evans, D.M. and Bernadis, C. (2000) A New Classification for Fingertip Injuries. *The Journal of Hand Surgery: British & European*, **25**, 58-60. <https://doi.org/10.1054/jhsb.1999.0305>

- [5] Muneuchi, G., Tamai, M., Igawa, K., Kurokawa, M. and Igawa, H. (2005) The PNB Classification for Treatment of Fingertip Injuries. *Annals of Plastic Surgery*, **54**, 604-609. <https://doi.org/10.1097/01.sap.0000158066.47194.9a>
- [6] Martin, C. and González del Pino, J. (1998) Controversies in the Treatment of Fingertip Amputations. Conservative versus Surgical Reconstruction. *Clinical Orthopaedics and Related Research*, **353**, 63-73. <https://doi.org/10.1097/00003086-199808000-00008>
- [7] Ihekire, O., Salawu, S.A.I. and Opadele, T. (2010) International Surgery: Causes of Hand Injuries in a Developing Country. *Canadian Journal of Surgery*, **53**, 161-166.
- [8] Grivna, M., Eid, H.O. and Abu-Zidan, F.M. (2016) Epidemiology of Isolated Hand Injuries in the United Arab Emirates. *World Journal of Orthopedics*, **7**, 570-576. <https://doi.org/10.5312/wjo.v7.i9.570>
- [9] Doraiswamy, N.V. (1999) Childhood Finger Injuries and Safeguards. *Injury Prevention*, **5**, 298-300. <https://doi.org/10.1136/ip.5.4.298>
- [10] Oleske, D.M. and Hahn, J.J. (1992) Work-Related Injuries of the Hand: Data from an Occupational Injury/Illness Surveillance System. *Journal of Community Health*, **17**, 205-219. <https://doi.org/10.1007/BF01321653>



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We are also interested in: 1) Short Reports—2-5 page papers where an author can either present an idea with theoretical background but has not yet completed the research needed for a complete paper or preliminary data; 2) Book Reviews—Comments and critiques.

Notes for Intending Authors

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