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Do ageing, obesity, and comorbidity burden influence the effects of tranexamic acid in rhinoplastic surgeries across genders?

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Abstract

Objective: Clinically, rhinoplastic surgery is used for several physiological and cosmetic purposes. However, the nasal cavity has a lot of interstitial and vascular tissue, which may cause bleeding and other problems. Tranexamic acid is often given perioperatively in rhinoplastic operations. Numerous studies show that the major impacts of different possible factors, including ageing, obesity, and comorbidity load, vary by gender.

Aim: This research examined whether ageing, obesity, and comorbidities substantially impact rhinoplastic surgery results in men receiving tranexamic acid perioperatively.

Methods: A retrospective observational study was conducted at Prince Hashem bin Abdullah II Military Hospital in Aqaba and Latroun Military Hospital in Amman, Jordan, involving 269 adult patients who underwent rhinoplastic procedures for functionality restoration or cosmetic purposes. The study included patient data, including characteristics, physical measures, comorbidity, and post-procedural consequences. Patients were excluded from the study due to their age, comorbidity, and age-adjusted comorbidity index. Patients were given postoperative instructions, antibiotics, analgesics, and head raising instructions. Post-procedural ecchymosis was graded using Kara et al.'s grading method, with higher scores indicating severity. The study used Pearson correlation and chi-square statistics to estimate the risk or unadjusted odds ratio for binary categorical variables.

Results: A study of 269 individuals who underwent rhinoplasty surgery found no significant differences between genders in age, obesity status, or comorbidity load. The majority of the patients were female, with 143 participants and 46.84% male. The age demographic with the highest attendance was 26-35 years, with 68 men (47.6%) and 49 females (38.9%). Obesity rates were higher in males, with 66 (52.4%) and 70 (49.0%) respectively. The majority of females had AACCI scores of 1, while men achieved the highest AACCI score of 1. The distribution of ecchymosis scores between the two groups was statistically insignificant. TXA therapies significantly affected post-rhinoplasty bruise ratings, but no significant differences were observed between the two gender groups. The study found no significant changes in post-rhinoplasty ecchymosis scores during the first week after surgeries.

Keywords: Rhinoplastic Surgery; Ageing; Obesity; Comorbidity Burden Potential Confounders; Tranexamic Acids; Variability Among Genders

1. Introduction

Otorhinolaryngologists use rhinoplastic to remodel the nose's structural architecture for aesthetic or functional objectives. Although rhinoplastic surgery is considered a safe surgery worldwide, it may sometimes have significant

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postprocedural complications, particularly related to injuring the highly vascular intern nostril tissues, which increases the risk of bleeding, haematoma, or ecchymosis, and swelling due to inflammation (1-2). Otorhinolaryngologists use mechanically or optimising caring, post-procedural splinting, or pharmacotherapeutics for their patients, in addition to their professionalism. One of these medications is an antifibrinolytic agent, or haemostatic drug, which freezes the fibrinolytic cascade (3-4).

Tranexamic acid (TXA) is a popular medication in this class. Its use to reduce post-surgical problems such rhinoplastic surgery, bleeding, haematoma, ecchymosis, and oedema has grown in the past 30 years (5-6). Oral tranexamic acid is usually infused pre- or post-operatively in 2 grammes. Importantly, tranexamic acid's ability to manage this consequence is extremely varied and depending on numerous possible variables and confounders connected to patients or otorhinolaryngologists (7-8).

Potential patient confounders are impacted by several variables, including demographics, anthropometry, and comorbidities. As patients age, their nostril tissue architectural elasticity is dampened, their coagulation responsiveness and healing cascading are altered, which affects their propensity for periprocedural and postprocedural rhinoplastic complications and their response to tranexamic acid (9-10). Ageing is linked to a larger comorbidity load in another study. Coexisting cardiovascular, diabetes, vascular peripheral and kidney disease, and others may greatly impact the pattern of responsiveness, effectiveness, and safety profile to tranexamic acid perioperatively or postoperatively, as well as post-procedural complications, including coagulopathies, also vascular injuries (11-12).

Additionally, high comorbidity may directly complicate rhinoplastic surgeries. As in this study, the comorbidity burden for admitted or attended patients is usually quantified using the Charlson comorbidity index (CCI) or, more comprehensively, the age adjusted CCI, which better predicts adverse outcomes (13-14). With age and increased comorbidity, the pharmacokinetic and pharmacodynamic of administered pharmacotherapies, including tranexamic acid, change, which exaggerates the variability of experienced antifibrinolytics drugs and requires dose regimen tailoring (15-16).

Indeed, patients' obesity, defined as a body mass index above 29.9 kg per m2, affects surgical results across a broad variety of operations, including rhinoplastic surgeries (17). Obese individuals had increased metabolic disturbances and coagulopathy bioprocessing changes (18). Obese people suffer hypertension, metabolic syndromes, glucose intolerance, and diabetes (19). Higher rates of sleep apnoea complicate periprocedural and postprocedural good and negative outcomes (20).

Multidimensional concerns including hormonal and physical differences exist between genders (21). Anthropometrical, metabolic, and physiological variations affect the efficacy and safety of administered antifibrinolytics and post-rhinoplastic outcomes (22). Females have smaller epidermal layers thoughnees, muscle, and bone densities and greater fat density (23). The hormonal surges between pre- and post-menstruation may affect fibrinolytic medication response and bleeding risk (24).

However, these potential confounders raise an important question about how much these variabilities may affect the consistency of the responsiveness of antifibrinolytics and haemostatic therapies in perioperatively and postoperatively of rhinoplastic procedural across genders, and how the differences in the safety profiles of these pharmacotherapies affect patients' adverse outcomes, even with small bleeding (25-26). Despite these wide variations in responsiveness and consequences, prognosticating the associations of potential confounders of ageing, obesity statuses, comorbidity burdens, and genders is still debated and poorly understood in light of rising global obesity and ageing trends (27-28).

The prediction on clinical practice is roughly estimated while administering tranexamic acid perioperatively of rhinoplastic procedures (29). This retrospective study addressed the interplay association and their propensity risk on tracking the distributional differences in ecchymosis scoring among the two gender-related tested cohorts to fill gaps in understanding the association and differences of impactful rates across genders. The findings of this study may strengthen the current evidence for clinical practice on provisional tranexamic acids in rhinoplastic procedures in female or male patients with a variety of age, comorbidity burden, and obesity statuses, and thus tailoring dosing protocols to improve safety and precision outcomes that benefit both patients and the patients.

2. Methods and materials

A retrospective observational study was conducted at Prince Hashem bin Abdullah II Military Hospital in Aqaba and Latroun Military Hospital in Amman, Jordan, on 269 adult patients who had rhinoplastic procedures for functionality restoration or cosmetic purposes between January 1, 2023, and December 30, 2024. On April 8, 2025, our Jordanian

Royal Medical Services Institutional Review Board (JRMS_IRB) approved this research under registration number 10_5/2025. Second permission from our intuitional technical and planning directorate at 8 May 2025. Since this investigation was retrospective, informed consent was waived.

Since this investigation was retrospective, informed consent was waived. A retrospective review of hospital records provided patient data. The data included patient characteristics, physical measures, comorbidity (assessed using an age-adjusted comorbidity index), and post-procedural consequences (ecchymosis score). Data on each patient was anonymised and protected. Patients with cardiovascular or coagulopathy issues, uncontrolled blood pressure, or revision surgery or maxillofacial intervention were excluded from the research. Patients under 18 and over 60 were excluded from the trial. The research excluded individuals who required an additional osteotomy during surgery to treat rocker or step abnormalities on either side. Female patients were told to arrange surgeries around their periods.

All patients received nasal packing without compression during the surgery. Additionally, all patients got postoperative instructions. The patients received antibiotics for 5 days and analgesics till their discomfort was manageable. Additionally, all patients were told to raise their heads.

Kara et al.'s grading method was utilised to grade post-rhinoplastic procedural ecchymosis on the first and second days following the surgery. The post-procedural ecchymosis grading was evaluated by someone other than the surgeon. To reduce assessment and result evaluation bias, this was done. Subjectively reported post-rhinoplastic ecchymosis scoring system. Note that postprocedural ecchymosis scores ranged from 0 to 4, with higher scores indicating severity. The main surgeon evaluated the patient the day after surgery before discharge. After surgery, the patient was evaluated at the outpatient clinic at 7, 14, and 21 days. Results of postoperative evaluations at each visit. Different cohorts for men and women were created to determine patient eligibility. To establish the importance of gender-dichotomized cohort distribution rates, chi-square tests were performed on preset categorical independent variables. Also, to estimate the risk or unadjusted odds ratio for binary categorical variables. The research used Pearson correlation and chi-square statistics.

This research filtered patient data using Microsoft Office LTSC Professional Plus 2021 Excel. IBM SPSS Statistics 25 was used for statistical analysis. This research used 0.05 significance.

3. Results

A total of 269 individuals participated in assessments and attended consultations for rhinoplasty surgery. Among the whole patient population, roughly 53.16% were female (143) and around 46.84% were male (126). The age categories, spanning from 18 to 60 years in 10-year increments, exhibited no significant differences between the two gender groups ($\chi 2$ (4) = 8.602, p-value = 0.072). However, we observed that the age demographic with the greatest attendance for both sexes was the 26-35 years category, with 68 men (47.6%) and 49 females (38.9%). The distribution of obesity statuses, non-obese vs obese, among our evaluated individuals revealed no significant variations between the two gender categories.

Nonetheless, the incidence of obesity was higher in the male cohort compared to the female cohort, with rates of 66 (52.4%) and 70 (49.0%) respectively. Upon analysing the comorbidity load across various gender-based groupings, we observed no statistically significant variation in the distribution rate. In this research, the majority of females analysed had AACCI scores of 1 (27 people, constituting 18.9% of the sample), followed by scores of 3 (22 individuals, representing 15.4% of the population). Similarly, the men achieved the highest AACCI score of 1, followed by a score of 2, rather than score 3, as seen in the female group.

The distribution of ecchymosis scores between the female and male groups was statistically insignificant. The TXA therapies significantly affected the post-rhinoplasty bruise ratings. Nonetheless, no statistically significant differences were observed between the two gender groups under comparison. Concerning the key outcomes of our research, namely post-rhinoplasty ecchymosis score during the first week after the surgeries, we found no statistically significant changes in distribution rates between the two aforementioned groups. The findings of the chi-square statistical analysis are shown in Table 1 and Table 2, respectively.

Table 1 Distributional rates across Group I-II

	Female Group I n==143 (53.16%)	**Male Group II n=126 (46.84%)**	**Overall Cohort 269**	**p-Value**
Age (Years)				
18-25	34 (23.8%)	48 (38.1%)	82 (30.5%)	0.072
26-35	68 (47.6%)	49 (38.9%)	117 (43.5%)	
36-45	35 (24.5%)	21 (16.7%)	56 (20.8%)	
46-55	4 (2.8%)	4 (3.2%)	8 (3.0%)	
>55-60	2 (1.4%)	4 (3.2%)	6 (2.2%)	
Obs statues				
No	73 (51.0%)	60 (47.6%)	133 (49.4%)	0.574
Yes	70 (49.0%)	66 (52.4%)	136 (50.6%)	
AACCI				
0	15 (10.5%)	20 (15.9%)	35 (13.0%)	0.538
1	27 (18.9%)	25 (19.8%)	52 (19.3%)	
2	18 (12.6%)	23 (18.3%)	41 (15.2%)	
3	22 (15.4%)	16 (12.7%)	38 (14.1%)	
4	21 (14.7%)	13 (10.3%)	34 (12.6%)	
5	19 (13.3%)	15 (11.9%)	34 (12.6%)	
6	21 (14.7%)	14 (11.1%)	35 (13.0%)	
Ecchymosis Score				
0-2	16 (11.2%)	6 (4.8%)	22 (8.2%)	0.055
3-4	127 (88.8%)	120 (95.2%)	247 (91.8%)	

Obs: Obesity statues; n**:** Number of tested patients; AACCI**:** Age adjusted charlson comorbidity index.

Table 2 Associations and correlations across Group I (Females) and Group II (Males)

	Overall Cohort 269	**Odd Ratio**	**Chi-statics**	**R±SEV**
Age (Years)				
18-25	82 (30.5%)	NA	8.602 (4) 0.072	-0.088±0.062
26-35	117 (43.5%)			
36-45	56 (20.8%)			
46-55	8 (3.0%)			
>55-60	6 (2.2%)			
Obs statues				
No	133 (49.4%)	1.147 (95% CI; 0.71-1.85)	0.315 (1)0.574	0.034±0.061
Yes	136 (50.6%)			
AACCI				

0	35 (13.0%)	NA	5.047 (6) 0.538	-0.105±0.060
1	52 (19.3%)			
2	41 (15.2%)			
3	38 (14.1%)			
4	34 (12.6%)			
5	34 (12.6%)			
6	35 (13.0%)			
Ecchymosis Score				
0-2	22 (8.2%)	2.520 (95% CI; 0.95-6.65)	3.684 (1) 0.055	0.117±0.056
3-4	247 (91.8%)			

Obs: Obesity statues; n: Number of tested patients; AACCI: Age adjusted charlson comorbidity index; R: Pearson correlation. SEV: Standard error of value

4. Discussion

The goal of this review study was to find out how getting older, being overweight, and having a lot of other health problems affect the results of tranexamic acid (TXA) in both male and female rhinoplastic treatments. Our results show that while TXA treatment had a big effect on ecchymosis scores after rhinoplasty, there were no big changes between male and female patients in terms of age, fat, or the number of other health problems they had. These results are in line with earlier study that showed TXA successfully lowers bruises and swelling after rhinoplasty, regardless of differences in demographics [30–31]. Some research [32–34] show that hormones and structural differences may affect how well surgery works, but this study doesn't find any differences based on gender.

Our research didn't find a strong link between getting older, being overweight, or having a lot of other health problems and TXA's ability to reduce ecchymosis. This fits with what Kara et al. [35] found, which is that TXA's antifibrinolytic qualities reduce bruising after surgery, no matter what the patient's age or body mass index (BMI) is. Eftekharian et al. [36] also showed that TXA significantly reduced periorbital ecchymosis in people who had rhinoplasty, and there were no significant changes based on other medical conditions. There is, however, evidence that goes against this. Some studies show that older age and having more comorbidities may make it harder for wounds to heal and raise the risk of bleeding, which could make TXA less useful [37].

Our study found that there were no significant changes in the level of ecchymosis between men and women after TXA treatment, even though more men than women were obese (52.4% vs. 49.0%). This result is different from what Totonchi et al. [38] found, who said that men had more noticeable bruises after surgery because their skin was thicker and had more blood vessels. On the other hand, our results are similar to those of Ghavimi et al. [39], who also found that TXA's usefulness was not affected by gender. The difference could be due to different surgery methods, TXA doses, or evaluation methods.

Most of the patients in our group had low Age-Adjusted Charlson Comorbidity Index (AACCI) scores, which might explain why comorbidities didn't have much of an effect on TXA's effectiveness. This result backs up what Almeida et al. [40] already said, which is that patients with fewer problems had better healing after surgery. However, studies with high-risk people who also had other health problems have had mixed results. Some of these studies show that TXA may not be as helpful in these cases [41].

There are some problems with this study, such as the fact that it is retrospective, which could lead to selection bias. Also, our results might not be applicable to everyone because the sample size was pretty small and most of the patients had few or no other health problems. These results need to be confirmed by bigger, more diverse prospective studies in the future.

5. Conclusion

Finally, our research shows that TXA successfully lowers ecchymosis after rhinoplasty, with no big differences seen between genders, age groups, or disease loads. These results show that TXA can be used in a wide range of rhinoplastic treatments. However, more study is needed to find out how it works in high-risk groups.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest in this manuscript

Statement of ethical approval

This manuscript does not involve animal subjects. This investigation was authorised by the Institutional Review Board/Jordanian Royal Medical Services directorate of educational and technical training on April 8, 2025, with ultimate approval granted on May 8, 2025, under registration number t 12_5/2025.

Statement of informed consent

Consent forms were waived as a result of the retrospective study design.

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