Open Access

Original Article

# Cardio-Respiratory and Metabolic Implication of Intranasal Packing in Patients Undergoing Sino-Nasal Surgery

**Nadeem Ahmed Sheikh, Wasif Anwar*, Yasser Saeed Khan**, Fuad Ahmed Siddiqi*, Asma Hayat***, Kanwal Nadeem *****

Department of Otorhinolaryngology (ENT), Combined Military Hospital, Jhelum/National University of Medical Sciences (NUMS) Pakistan, *Department of Medicine, Combined Military Hospital, Peshawar/National University of Medical Sciences (NUMS) Pakistan, **Department of Surgery, Combined Military Hospital, Sialkot/National University of Medical Sciences (NUMS) Pakistan, ***Department of Pathology, Combined Military Hospital, Jhelum/National University of Medical Sciences (NUMS) Pakistan, *****Medical Officer, Al Mustafa Trust Hospital, Rawalpindi Pakistan

## ABSTRACT

***Objective:*** To determine impact of various forms of intra nasal packings and trans-septal suturing (without nasal packing) on cardiopulmonary and metabolic milieu of patients undergoing nasal and paranasal sinus operations.

***Study Design:*** Randomized controlled trial.

***Place and Duration of Study:*** Department of Otorhinolaryngology (ENT), Combined Military Hospital, Jhelum, Pakistan, from Aug 2022 to Aug 2023.

***Methodology:*** Clinical and laboratory markers of cardio-pulmonary and metabolic assessment of 140 subjects were evaluated, who had undergone some form of intranasal packing procedure or trans-septal suturing (without nasal packing) following nose or paranasal sinus operations.

***Results:*** Ventilated nasal packs and completely avoiding nasal packing by performing trans-septal suturing have a significant impact on clinical parameters like resting heart rate, respiration, blood pressure, arterial blood pH and arterial blood partial pressure of carbon dioxide ($PaCO^2$) in patients undergoing surgical operations of the nose and paranasal sinuses.

***Conclusion:*** We strongly recommend adopting less invasive and technically more advanced operative methodology and refining surgical expertise regarding septal splinting during rhinologic operative procedures, mitigating discomfort and antecedent morbidity in patients undergoing these sino-nasal surgical operations.

**Keywords:** Epistaxis, Hematoma, Hypoxia, Nasal septum, Oxygen consumption, Respiration, Splints.

***How to Cite This Article:*** *Sheikh NA, Anwar W, Khan YS, Siddiqi FA, Hayat A, Nadeem K. Cardio-Respiratory and Metabolic Implication of Intranasal Packing in Patients Undergoing Sino-Nasal Surgery. Pak Armed Forces Med J 2023; 73(5): 1535-1540 DOI: https://doi.org/10.51253/pafmj.v73i5.10107*



## INTRODUCTION

Breathing signifies life. Changes in nasal airflow pose momentous influence on human physiology and the quantum of respiration is ever changing since birth till the end. This variation can sometimes be random, non-random; influenced or un-influenced by extrinsic or intrinsic factors; and, correlated or uncorrelated with health and disease.[1] Strained ventilation carries unfavorable influence on cardio-respiratory physiology and may precipitate metabolic disturbance. Patients frequently consult for mitigating nasal obstruction often associated with a myriad of conditions.

About of 16.6% of US population suffers from nasal obstruction, mostly consequent to rhinosinusitis, deviated nasal septum and nasal polyposis. About of 66% of them report with nasal congestion warranting surgical intervention in the nose and paranasal sinuses.[2] About of 60% of global population comes across nosebleeds regardless of etiology at any point of time, with more than half (57%) of these patients being subjected to some form of nasal packing.[3] Universally, 88.6% people have deviated nasal septum, out of which, 25% report with certain degree of nasal airway obstruction.[4] Operative correction of a deflected nasal septum constitutes third most frequently carried out otorhinolaryngology surgery in the United States.[5] Nasal packing is universally performed as a temporary measure to secure blood loss from nose bleeds as well as splinting the septum against hematoma formation after septal reconstruction, and as part of open and endoscopic nasal and paranasal sinus operations. Intranasal packing is widely offered, cost effective and requires relatively less clinical expertise. However, concurrently it carries morbidities for the patient including pain, headache, epiphora, altered taste, difficulty in swallowing, anxiety, sleep disturbance and discomfort/bleeding at pack removal.

Outcome of nasal packing versus no packing has previously been regionally analyzed in terms of systemic blood pressure changes, subjective discomfort, pain, anxiety, epiphora, mucosal trauma and hemorrhage.[6] Nationwide, merits and drawbacks of nasal septal splinting with post-operative nasal packing

**Correspondence: Dr Nadeem Ahmed Sheikh,** ENT Department, Combined Military Hospital, Jhelum, Pakistan

*Received: 19 Mar 2023; revision received: 5 May 2023; accepted: 16 May 23*

against trans-septal suturing have extensively been compared, mainly subjectively.[7-9] The rationale of our research is to quantify the impact of transient hypoxemia caused by various forms of temporary intranasal packing, as well as transseptal suturing (without nasal packs) specifically on cardio-respiratory and metabolic parameters of operated patients in our setup. We aim at expanding the evidence base for informed decision-making regarding patient safety related with these procedures.

## METHODOLOGY

We obtained a formal approval for this randomized controlled trial from the institutional research ethics committee, encompassing all ethical, technical and social issues pertaining to the research (IERB-01/3/23/Trg dated 8 March 2023).

**Inclusion Criteria:** About of 140 patients, who underwent sino-nasal operative interventions between August 2022 and August 2023, at Combined Military Hospital, Jhelum, Pakistan, were randomized according to surgeon's preference, into three groups, regardless of age and gender.

**Exclusion Criteria:** Those who declined to consent, those suffering from cardiovascular or metabolic diseases (and/or receiving treatment) and bleeding diathesis, those declared unfit for operation under general anesthesia due to any reason, and patients allergic to Portex®, Vaseline® & adhesive plaster were excluded.

Group-1 patients were offered conventional bilateral intranasal packing with Vaseline® gauze mesh for 24 hours after the procedure. Patients included in Group-2 were offered ventilated bilateral nasal packs made up of Vaseline® gauze mesh wrapped around suitable sized Portex® endotracheal tube splints, inserted for 24 hours after the procedure. Intranasal transseptal suturing was performed using absorbable Vicryl® 2/0 sutures passed through a modified awl by bending distal 1/3 of 16 G (outer diameter 1.63mm) disposable angiocatheter to 15$^{o}$ curvature, applying three to four running basting sutures over the septum in patients included in Group-3, thus avoiding nasal tamponade. We obtained written informed consent from every patient or first degree relative.

Age, gender, body mass index, resting heart rate, respiratory rate, oxygen saturation, arterial blood pressure, indication for operation, type of nasal packing (whether or not) inserted, were recorded at the time of hospitalization. Pre-operative arterial blood gases were analyzed for pH, $pCO_2$, $pO_2$, bicarbonate (actual) and arterial blood oxygen saturation on pHOx Ultra® ABG analyzer (Nova Biomedical) based on principle of potentiometry. Sample for ABGs were obtained in heparinized syringes by trained intensive care paramedical staff and immediate analysis was performed to maintain quality of results.

At the end of 24 hours of operation, resting heart rate, respiratory rate, arterial blood pressure, oxygen saturation & arterial blood gas analysis were repeated.

Data was recorded and analyzed in Statistical Package for Social Sciences version 27. Descriptive statistics were applied to find out frequencies. We applied one-way analysis of variance ANOVA to measure statistical significance of individual parameter among the three independent study group variables, assuming equal variance in post-hoc Tukey for multiple comparisons. Arbitrary level of statistical significance was kept below 0.05.

## RESULTS

Out of 140 patients, 103(73.6%) were assigned Group-1, 14(10%) were included in to Group-2 and 23 (16.4%) belonged to Group-3. Mean age of our patients was 31.09±10.77 years. Intranasal packing was carried out for management of epistaxis in 14(10.0%), septoplasty and inferior turbinates reduction in 38(27.1%), inferior turbinectomy alone in 19(13.6%), incision and drainage of traumatic septal hematoma in 6(4.3%) and conventional septoplasty in 63(45.0%) patients. Among all these patients who consented for their surgical operation, 113(80.7%) were males and 27(19.3%) were females.

Statistical comparison of change in clinical and biochemical parameters in all three research groups, before and after undergoing operative intervention has been displayed in Table-I. Ventilated nasal packs (Group-2) and nasal septal suturing (only) (Group-3) carried a significant difference on patients' systolic and diastolic blood pressures, post-operatively. Completely avoiding nasal packing after nasal surgical procedure imposed a marked statistical difference in patients' heart rate, when compared to patients having conventional nasal packing in place. Noticeable improvement in resting respiratory rate was seen in all patients after nasal surgery with or without nasal packs. However, oxygen saturation with finger probe monitoring revealed a clear difference when post-operative recording was compared between patients of Group-3 with Group-1. A remarkably significant difference between post-operative arterial blood pH between all study groups was demonstrated. A strong statistical significance was noticed when arterial blood partial

**Table-I: Comparison of pre-operative vs. post-operative mean scores**

| Clinical and Arterial Blood Gas Parameter | Study Group | Pre-Operative | Post-Operative | Difference in Mean Pre and Post-Operative Recordings | *p*-value |
|---|---|---|---|---|---|
| | | Mean±SD | | | |
| Systolic blood pressure (mmHg) | 1 | 121.71±15.23 | 131.75±12.14 | +10.04 | <0.001 |
| | 2 | 113.93±6.25 | 117.86±12.51 | +3.93 | 0.004 |
| | 3 | 128.22±15.82 | 118.91±11.96 | -9.31 | <0.001 |
| Diastolic blood pressure (mmHg) | 1 | 82.62±12.49 | 87.69±10.68 | +5.07 | <0.001 |
| | 2 | 77.14±4.68 | 80.71±8.28 | +3.57 | <0.001 |
| | 3 | 84.04±11.89 | 78.04±10.41 | -6 | 0.001 |
| Heart rate (beats/min) | 1 | 84.00±11.88 | 93.00±16.40 | +9 | <0.001 |
| | 2 | 87.00±11.88 | 86.00±7.40 | -1 | <0.001 |
| | 3 | 90.00±7.84 | 82.00±8.16 | -8 | 0.040 |
| Respiartions (breaths/min) | 1 | 17.00±1.28 | 20.00±6.61 | +3 | 0.001 |
| | 2 | 20.00±1.65 | 19.00±2.50 | -1 | 0.050 |
| | 3 | 18.00±1.70 | 15.00±2.16 | -3 | 0.001 |
| Resting oxygen saturation (%) | 1 | 97.47±1.04 | 96.01±3.05 | -1.46 | 0.110 |
| | 2 | 98.70±0.46 | 97.43±0.93 | -1.27 | 0.007 |
| | 3 | 97.30±1.02 | 97.70±1.06 | +0.4 | 0.010 |
| Arterial blood pH | 1 | 7.37±0.04 | 7.38±0.04 | +0.01 | <0.001 |
| | 2 | 7.33±0.07 | 7.43±0.02 | +0.1 | <0.001 |
| | 3 | 7.36±0.03 | 7.35±0.03 | -0.01 | 0.980 |
| Partial pressure of carbon dioxide ($PaCO^2$) in arterial blood (mmHg) | 1 | 36.49±5.92 | 33.06±8.00 | -3.43 | 0.001 |
| | 2 | 34.54±1.51 | 29.48±2.96 | -5.06 | 0.010 |
| | 3 | 35.78±4.17 | 35.57±5.78 | -0.21 | 0.823 |
| Partial pressure of oxygen ($PaO^2$) in arterial blood (mmHg) | 1 | 95.48±31.32 | 116.97±58.62 | +21.49 | 0.009 |
| | 2 | 74.03±21.10 | 153.85±64.18 | +79.82 | <0.001 |
| | 3 | 108.26±20.50 | 118.68±43.78 | +10.42 | <0.001 |
| (Actual) arterial blood bicarbonate (mmol/l) | 1 | 21.95±2.66 | 19.87±3.81 | -2.08 | 0.029 |
| | 2 | 18.72±3.99 | 20.17±1.79 | +1.45 | 0.010 |
| | 3 | 21.80±2.02 | 19.75±3.49 | -2.05 | <0.001 |
| Arterial blood oxygen saturation ($SaO^2$), (%) | 1 | 91.57±16.59 | 92.50±14.63 | +0.93 | 0.898 |
| | 2 | 89.86±9.18 | 98.36±0.49 | +8.5 | 0.012 |
| | 3 | 95.96±5.85 | 97.26±4.49 | +1.3 | 0.002 |

pressure of carbon dioxide ($PaCO^2$) was compared post-operatively between Group-2 and Group-3. We observed no statistically significant change in pre-operative and post-operative arterial (actual) bicarbonate levels and arterial blood oxygen saturation between any of the group both pre-operatively and post-operatively (Table-II).

## DISCUSSION

A strong yet vague shift towards metabolic acidosis component prevails in our research which is likely to the IV fluids administered and medications. In patients subjected to conventional nasal packing (Groups 1 and 2), hyperventilation – due to a feeling of suffocation – caused a fall in $PaCO^2$ with a concurrent rise in pH. In patients subjected to trans-septal suturing, we observed that $PaCO^2$ declined but less in comparison to Groups 1 and 2. This decline was due to improved ventilation following the surgical relief of the obstruction rather than hyperventilation in the other two groups; therefore, the underlining shift towards metabolic acidosis prevailed and hence a decline in both the arterial blood $HCO^3$ and the pH. Hemodynamic parameters showed worsening in research Groups 1and 2 and improvement in Group-3. The improved outcomes in patients belonging to Group-3 (post-operative heart rate, systolic and diastolic pressure and respiratory rate) are postulated to be attributed to relief of nasal obstruction and freedom from a feeling of suffocation imposed be the nasal tamponade, which caused an increase in the sympathetic surge.

Sari and Gencer reported a significantly smaller decline in $pO^2$ levels in patients who underwent trans-septal suturing, than those with intranasal packing following septoplasty. They also observed a significant rise in post-operative blood pH within nasal packing group (0.017), a steeper decline in post-operative $pO^2$ (0.001) and $SaO^2$ (<0.001).[10]

Longstanding bilateral nasal obstruction is known to result in marked tachypnea in murine models.[11] Zayyan *et al.* concluded that cardiac signs were possibly attributed to vagal stimulation triggered by nasal mucosal compression rather than airway occlusion.[12] With the help of 24-hour Holter electrocardiography they confirmed a significant increase in resting heart

**Table-II: Inter-group comparison table (Post Hoc analysis)**

| Group Comparison | Group-1 vs. Group-2 (*p* value) | Group-1 vs. Group-3 (*p* value) | Group-2 vs. Group-3 (*p* value) |
|---|---|---|---|
| Pre-operative systolic blood pressure (mmHg) | 0.156 | 0.138 | 0.013 |
| Post-op systolic blood pressure (mmHg) | <0.001 | <0.001 | 0.964 |
| Pre-operative diastolic blood pressure (mmHg) | 0.241 | 0.862 | 0.203 |
| Post-operative diastolic blood pressure (mmHg) | 0.053 | <0.001 | 0.731 |
| Pre-operative heart rate (beats/min) | 0.697 | 0.410 | 0.981 |
| Post-operative heart rate (beats/min) | 0.281 | 0.007 | 0.689 |
| Post-operative resting respirations (breaths/min) | 0.762 | <0.001 | 0.120 |
| Pre-operative resting respirations (breaths/min) | <0.001 | <0.001 | 0.002 |
| Pre-operative resting oxygen saturation (%) | <0.001 | 0.764 | <0.001 |
| Post-operative resting oxygen saturation (%) | 0.156 | 0.020 | 0.954 |
| Pre-operative arterial blood pH | 0.006 | 0.806 | 0.073 |
| Post-operative arterial blood pH | <0.001 | 0.011 | <0.001 |
| Pre-operative partial pressure of carbon dioxide in arterial blood (mmHg) | 0.416 | 0.838 | 0.776 |
| Post-operative partial pressure of carbon dioxide in arterial blood (mmHg) | 0.205 | 0.301 | 0.041 |
| Pre-operative partial pressure of oxygen in arterial blood (mmHg) | 0.028 | 0.139 | 0.002 |
| Post-operative partial pressure of oxygen in arterial blood (mmHg) | 0.064 | 0.991 | 0.168 |
| Pre-operative (actual) arterial blood bicarbonate (mmol/l) | <0.001 | 0.970 | 0.003 |
| Post-operative (actual) arterial blood bicarbonate (mmol/l) | 0.956 | 0.988 | 0.938 |
| Pre-operative oxygen saturation in arterial blood (%) | 0.913 | 0.405 | 0.445 |
| Post-operative oxygen saturation in arterial blood (%) | 0.244 | 0.242 | 0.965 |

rate of patients resorted to nasal packing. They found out a significant fall in arterial $HCO^3$ and $pCO^2$ levels; however, oxygen saturation, $pO^2$ and pH remained unaltered. Naseem *et al.* demonstrated an increase in mean systolic and diastolic arterial blood pressures before and after surgery, respectively.[13] Banglawala *et al*. in a meta-analysis of 2 randomized controlled trials and 12 prospective observational researches, only 9 demonstrated statistically significant variation in at least 1 of the cardio-respiratory parameters studied, the aggregate results being inconsistent with no major cardio-respiratory event.[14]

Ribbon gauze impregnated with Vaseline® nasal packs are plagued with significant ingress of mucosal tissue inside its webbed outline often causing bleeding upon removal.[15] Akhter and Gul invalidated significant correlation between hemorrhage and time of packs retrieval after sub-mucoperichondrial resection operation.[16] However Abdelghani et al highlighted its benefit if retrieved within six hours after surgical intervention.[17]

Toxic shock syndrome has been described in patients having nasal packing in situ.[18] Smith and Reddy reported sudden hypoxia at extubation following accidental aspiration of Nasopore® nasal packing after adenoidectomy, necessitating emergency bronchoscopic retrieval of the pack.[19] Cited by Lovinescu *et al.* a similar account was reported where an aspirated nasal pack accidentally dislodged into left main bronchus during recovery.[20] Unanticipated trigemino-cardiac reflex (naso-pulmonary or Kratschmer reflex) has been reported as a most dreaded potential complication associated with nasal packing, in which trigeminal stimulation from constant pressure eventuates into catastrophic bradycardia, AV block, syncope, bronchospasm, asystole and even death.[21]

Considering the complications of nasal packing, trans-septal suturing has been popularized over the past few decades as a substitute. With little improvisation in suturing technique, it circumvents the complications associated with nasal packing.[3,22] In a randomized controlled trial, Majeed and Saeed evidenced improved outcome in patients in whom quilting trans-septal suturing had been performed. They noticed a significantly higher mean score of headache, facial pain and disturbed sleep, breathing and swallowing impairment in nasal packing group at 24 hours after the operation (<0.001) However over a month of follow up they found no statistical difference in complications between the nasal packing and trans-septal suturing groups (>0.05).[23] Shah *et al.* demonstrated high incidence of postoperative synechiae formation in patients subjected to intranasal packing as compared to patients with no nasal packing following septoplasty ($p$=0.005).[7] Khan *et al.* successfully placed sterile Foley catheter to achieve tamponade after Caldwell-Luc antrostomy, avoiding the need for intranasal packing.[24] Similarly, Durmaz (2018) and Haq *et al* (2012) applied trans-

septal 'chain' (Gülhane) suture, and 'basting' technique by running quilt suture from anterior to posterior end of the septum, respectively.[25]

History of operative rhinology has witnessed constant evolution in introducing alternate methods to meet the intent with or without nasal packing. However, despite these demerits, time tested conventional nasal packing still enjoys a pivotal place in the field.

## ACKNOWLEDGEMENTS

We are extremely grateful to the patients who gladly consented to become a part of our research.

## LIMITATIONS OF STUDY

We recorded parameters at 24 hours interval pre and post operatively. However, this was a limitation in our study, as hourly monitoring of patients after the surgery and a longer follow-up spanning more than 4 weeks would have been a better representation of the cardio-pulmonary and metabolic impact.

## CONCLUSION

Scientifically advanced methodology must be brought in to debate for better understanding of rather unelucidated theoretical factors responsible for cardio-respiratory and metabolic variation under the influence of intranasal packing. Good surgical technique, alternative bio-technology for septal splinting, hemostasis, prevention of synechiae and hematoma formation must always be considered to ensure patients' safety, comfort and improved quality of life.

**Conflict of Interest:** None

**Author's Contribution**

Following authors have made substantial contributions to the manuscript as under:

NAS & WA: Conception, study design, drafting the manuscript, approval of the final version to be published.

YSK & FAS: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

AH & KN: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## REFERENCES

1. Oku Y. Temporal variations in the pattern of breathing: techniques, sources, and applications to translational sciences. J Physiol Sci 2022; 72(1): 1-19. https://doi.org/10.1186/s12576-022-00847-z
2. Moubayed SP, Most SP. Evaluation and management of the nasal airway. Clini Plast Sur 2022; 49(1): 23-31. https://doi:10.1016/j.cps.2021.08.001
3. Kumar A, Kumar A, Mehar S, Kumar D, Khan MWU. Comparison of septoplasty with and without packing and splints. Prof Med J 2021; 28(04): 459-463. https://doi.org/10.29309/TPMJ/2021.28.04.6175
4. Moshfeghi M, Abedian B, Ahsaie MG, Tajdini F. Prevalence of nasal septum deviation using cone-beam computed tomography: A cross-sectional study. Contemporary clinical dentistry 2020; 11(3): 223-228. https://doi:10.4103/ccd.ccd_110_19
5. Alam M, Muhammad T, Usman M, Ahmad S. Effectiveness of septoplasty in releiving nasal obstruction in patients with deviated nasal septum. J Saidu Med Coll Swat 2022; 12(2): 71-74. https://doi.org/10.52206/jsmc.2022.12.2.663
6. Mandal S, Tripathi Ashwin N, Sharma A, Bhardwaj R. Transseptal suturing versus merocel nasal packing: A post septoplasty comparison. Indian J Otolaryngol and Head & Neck Surg 2020: 74(Suppl 2) 937-942. https://doi: 10.1007/s12070-020-02013-6.
7. Shah G. Comparison of septoplasty with and without nasal packing: Its association with post-operative nasal adhesion formation. J Islamabad Med Dental Coll 2018; 7(3): 169-173.
8. Ali SM, Sadaqat M, Hussain A, Aziz T, Khan F, Shah MI, et al. Comparison of anterior nasal packing versus quilting sutures after septoplasty in controlling postoperative bleeding. Pak J Physiol 2020; 16(1): 34-36. https://pjp.pps.org.pk/index.php/PJP/article/view/1199
9. Wasim MF, Riaz N, Aslam S, Bukhari SMAS, Mumtaz H, Husain I, et al. Post-operative hemorrhage in septoplasty with and without nasal packing, a comparative study at Otorhinolaryngology department of PNS Shifa Hospital, Karachi. Pak Armed Forces Med J (PAFMJ). 2020; 70(6): 1629-1633. https://doi.org/10.51253/pafmj.v70i6.3696
10. Sari K, Gencer M. The measurement of arterial blood gases and pulmonary function tests in the patients with transseptal suture and nasal packs with airway. Int J Surg Med 2020; 6(1): 42-47. https://www.ejmanager.com/mnstemps/136/136-1573211358.pdf?t=1699865022
11. Pazhoohan S, Abbasi Feijani F. Effect of nasal airflow on respiratory pattern variability in rats. Physiol Pharmacol 2022; 26(1): 70-78. https://ppj .phypha.ir/article-1-1727-en.html
12. Kumar A, Bajpai R, Joshi D. Temperature profile of nasal breathing for respiration monitoring in ambulatory settings. IEEE Sensors J 2022, [internet] avaialbe at: https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/pt/covidwho-2097639
13. Haq NU, Bakht Zada MH, Iqbal Z. Study the effect of bilateral nasal packing on systemic blood pre-ssure and prevalence of complications associated with nasal pac-king in patients who had undergone septoplasty. 2015, [internet] avaialbe at: https://www.academia.edu/31655014/awareness_ and_utilization_of_electronic_information_resources_among_medical_students
14. Kar M, Cetinkaya EA, Konşuk-Ünlü H. Comparison of the Ankaferd Blood Stopper Tampon and the Merocel Nasal Tampon after Septoplasty Surgery. Aesthetic Plast Surg. 2022: 47(1): 294-300. https://doi: 10.1007/s00266-022-03031-1
15. Han SH, Kim SH, Jo DI. Simultaneous Use of Bioabsorbable and Nonbioabsorbable Packing Materials During Closed Reduction of a Nasal Bone Fractures. J Craniofac Surg 2021; 32(8): e724-e726. https://doi: 10.1097/SCS.0000000000007705.
16. Akhtar S, Gul U. Anterior nasal packing post submucous resection (SMR): a comparison between removal on 1st versus 2nd post operative day. Pak Armed Forces Med J 2021(1): 91-95. https:// 10.51253/pafmj.v71i1.2709
17. Abdelghany AM, Elhamshary AS. The optimum duration of anterior nasal packing after common nasal surgeries. Pan Arab J Rhinol 2020; 10(2): 84-88. https://doi: 10.4103/pajr.pajr_22_19
18. Maul X, Dincer BC, Wu AW, Thamboo AV, Higgins TS. A clinical decision analysis for use of antibiotic prop-hylaxis for nonabsorbable nasal packing. Otolaryngol–Head and Neck Surg 2021; 165(5): 647-654. https://doi: 10.1177/019459 9820988740.

19. Smith J. Aspiration of Nasopore nasal packing. Case Rep 2017; 2017: bcr-2017-221969. https://doi:10.1136/bcr-2017-221969
20. Din-Lovinescu C, Trivedi U. Systematic review of negative pressure pulmonary edema in otolaryngology procedures. Ann Otol Rhinol Laryngol 2021; 130(3): 245-253.
21. Wong A, Bakar MZA. The nasocardiac reflex during nasoendoscopy: A commonly overlooked risk. Ame J Otolaryngol 2021; 42(2): 102869. https://doi: 10.1016/j.amjoto.2020.102869.
22. Bhutta ZI, Sheikh AH. Original articles comparison of the results of anterior nasal packing versus without anterior nasal packing for better management of septoplasty. Journal of Akhtar Saeed Medical & Dental Coll 2019; 1(2): 69-75.
23. Majeed SA, Saeed B. The Efficacy of Septal Quilting Sutures Versus Nasal Packing in Septoplasty. Indian J Otolaryngol Head & Neck Surg 2022; 74(2): 1713-1717. https:// doi:10.1007/s12070-021-02865-6
24. Khan MA, Jawaid A, bin Faiz S. Comparison of BIPP gauze packing versus maxillary antrum packing with Foley's catheter after Caldwell-Luc surgery in terms of re-bleeding and discomfort. J Postgrad Med Inst 2015; 29(3). https://jpmi.org.pk/index.php/jpmi/article/view/1652
25. Durmaz A. A Modification to the Nasal Septal Chain Suture Which Improves Its Application. J Craniofac Surg 2018; 29(2): 502-505. https://doi: 10.1097/SCS.0000000000004038.

.....