THE EFFECTS OF THE MIDDLE TURBINE ORIENTATION AND RESECTION ON SPHENOID SINUS IRRIGATE PENETRATION FOLLOWING ENDOSCOPIC SINUS SURGERY.

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Key Findings
- The Middle turbinate (MT) surgery has a positive impact on penetration of irrigate into the sphenoid sinus as compared to no dissection, ethmoidectomy or ostial procedures performed on sphenoid.
- MT medialisation is statistically equivalent to resection of MT, hence in surgical practice medialisation whether by suture conchopexy or controlled synchaece, is recommended during endoscopic sinus surgery especially when sphenoidotomidy is undertaken.
- MT surgery using a wide maxillary antrostomy has a significant negative impact on sphenoid sinus irrigation.
- Irrigation of the sphenoid sinus in “bending over the sink” position when no or minimal surgery is performed causes poor irrigate penetration. Endoscopic sinus surgery causes a small but significant improvement in penetration of irrigate.

Information/ Background
- Nasal irrigation has ancient roots but is still integral in the current management of chronic rhinosinusitis.
- The sphenoid sinus due to its peculiar median position, narrow access and present a unique challenge for adequate irrigation.
- Endoscopic sphenoidotomy is a commonly performed procedure as a part of Functional Endoscopic Sinus Surgery (FESS) as well as a portal for skull base surgeries. Also, middle turbinate (MT) surgery is an integral part of FESS.
- To determine how surgery on the middle turbinate (MT) may affect penetration of irrigation into the sphenoid sinus.

Materials and Methods
A prospective randomised interventional study was planned using 3D printing technology to create models paranasal sinus. Two life-size 3-D printed sinonasal models were prepared with video visualisation ports into the sphenoid sinus. Endoscopic sinus surgery was performed on each model from minimal to maximal dissection. The nasal cavities were irrigated with blue food colouring mixed with water from a NeilMed® Sinus Rinse™ bottle. All irrigation was performed in a 45° head-down position to mimic patients “bending over the sink”. Irrigation was recorded using visualisation ports drilled into the sphenoid sinus. Two blinded independent observers scored each irrigation according to a defined scale.

Statistical analysis was performed using non-parametric Kruskal-Wallis test and chi-square test and kappa analysis using the SigmaPlot software package version 12 (Systat Software, Inc., CA, USA).

Results
- A total of 160 video recordings were available for analysis. The interobserver agreement was found to be significant (kappa of >0.75).
- In the “bending over sink position” only 2.5% of irrigate penetrates the sphenoid sinus without any surgical intervention.
- When the MT was in the anatomical position i.e. Stages 1 to 4, no changes in sphenoid sinus irrigate penetration before sphenoidotomy (natural ostium) and after (p-value > 0.05).
- The size of the ostium and sphenoidethmoidotomy did not affect irrigate penetration when the middle turbinate was not addressed surgically.
- This study showed that irrigate penetration improved significantly when the MT was medialized onto the septum. A similar trend was observed when the MT was resected. Statistically MT medialization was equivalent to MT resection (p-value > 0.05).
- MT is in its anatomical position resulted in poor irrigate penetration irrespective of the extent of dissection of the sphenoid sinus (p-value < 0.00001). A surgically treated middle turbinate either medialized or resected had equivalent improvement in the penetration of irrigate after wide sphenoidotomy.
- There was a significant fall in irrigate penetration with wide sphenoidotomy with maxillary antrostomy and MT resected or medialized (p-value < 0.001).
- The “bending over the sink” position results in poor irrigate penetration (grade 1 and 2) within the sphenoid sinus; no dissection or minimal sinus dissection was statistically insignificant. However, we could observe that maximum surgical dissection resulted in statistically significant drop in poor penetration of irrigate.

Conclusion
Middle turbinate medialisation, whether by suture conchopexy or controlled synchaece, is recommended during endoscopic sinus surgery especially when sphenoidotomy is undertaken. Optimal sinus dissection improves sphenoid irrigate penetration but wide antrostomy has a negative impact on it.