Use of Perpendicular Plate of Ethmoid Split Technique in Rhinoplasty and Septoplasty

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Summary: In recent years, the perpendicular plate of ethmoid (PPE) has become a prominent choice for bone-grafting materials. This study introduces the PPE split technique for efficient removal of the bony septum or the harvesting of partial PPE for septal batten grafts in rhinoplasty and septoplasty, particularly suited for cases with a thick PPE. In this study, this technique was used to minimize septal defects and prevent complications while achieving harvested bony grafts of the desired effective thickness. In this retrospective study, 36 patients underwent surgery using the PPE split technique (22 septoplasties and 14 rhinoplasties). The procedure involved detaching the PPE from the septal cartilage and performing a vertical plane osteotomy with a no. 10 scalpel blade to remove bony spurs or prepare batten grafts. Paranasal sinus computed tomography revealed that the average anteroinferior PPE thickness was 3.46 mm. This technique was used for bony batten graft harvesting (26 cases), bony spur removal, and septum reshaping (10 cases). Successful PPE harvesting was achieved in all cases except for 3, which experienced graft breakage. This study demonstrates the viability and effectiveness of the PPE split technique as a supplementary maneuver in septoplasty and rhinoplasty procedures. Its diverse applications include reshaping, correcting deviated septum, harvesting bony batten grafts, and providing support for an aesthetically pleasing nasal profile. *(Plast. Reconstr. Surg.* 155: 863e, 2025.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.

The structural integrity and aesthetic appeal of the nasal framework are of paramount importance in rhinoplasty and septoplasty. These procedures can present challenges for surgeons in cases requiring robust bone grafting or intricate septal modifications. The perpendicular plate of ethmoid (PPE) bone has been recognized for its superior potential as a grafting resource for septal batten grafts to straighten areas of deviated nasal septum,[1–3] especially among Asians, who typically have weaker cartilage. This study introduces a pioneering PPE split technique aimed at efficient removal of the bony septum or harvesting of PPE grafts in rhinoplasty and septoplasty, which is particularly beneficial in cases with a thick PPE. This method endeavors to minimize septal defects, prevent complications, and procure bony grafts of the desired thickness to enhance surgical outcomes.

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This technique entails septal mucoperichondrial flap elevation and careful separation of the PPE from the adjacent septal cartilage, followed by a meticulous vertical plane osteotomy using a no. 10 scalpel blade. Subsequently, the upper border of the desired area on one side of the split septum was cut using septal scissors. The posterior and inferior parts were then fractured using a Freer elevator to obtain the graft (Fig. 1). (**See Video 1 [online]**, which demonstrates the PPE split technique. This technique was used in rhinoseptoplasty, particularly in cases involving a thick PPE. While achieving the harvested bony grafts with the desired effective thickness, this method can minimize septal defects and prevent complications.) A septal batten graft, as used in our technique, is a strip of bone derived from the PPE that is used to provide structural

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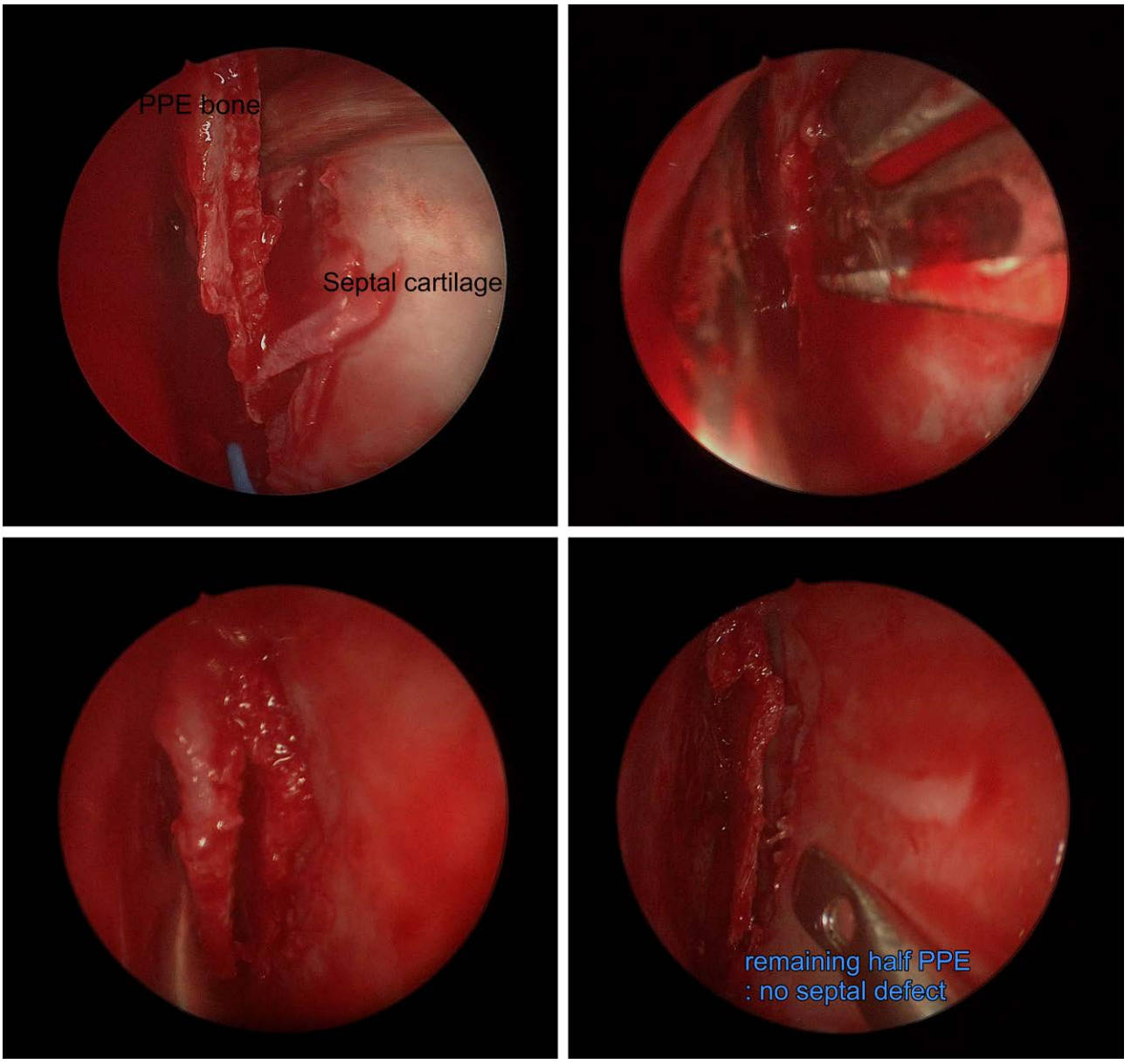

Fig. 1. PPE split technique in harvesting batten graft procedure. (*Above*, *left*) Separation of the PPE bone from the nasal cartilage. (*Above*, *right*) PPE split by means of vertical osteotomy using a no. 10 scalpel blade. (*Below*, *left*) One side of the split septum is cut using septal scissors and a Freer elevator to obtain the graft. (*Below*, *right*) Optimal thickness batten graft can be achieved leaving the remaining half of the PPE and mucosa intact. If needed, the remaining portion of the PPE can be harvested additionally.

support and alignment by battening onto deviated or weakened septal cartilaginous parts with sutures. Small holes were drilled along the bony graft using a microdrill following the same process as for conservative batten graft placement, to facilitate secure placement onto the cartilaginous septum and minimize the risk of breakage. The batten graft was positioned using 4-0 polydioxanone absorbable sutures along the cartilaginous septum where the greatest deviation was observed. (**See Video 2 [online]**, which demonstrates the bony batten graft placement on the septum.) In this study, the technique was performed according to the following inclusion criteria: (1) septoplasty or rhinoplasty requiring bony batten grafts, or the removal of a unilateral ridge or spur; and (2) an anteroinferior PPE thickness greater than 3.0 mm on preoperative coronal-plane paranasal sinus (PNS) computed tomographic (CT) scans and a thickness surpassing that of a wooden stick shaft of a sterile swab (approximately 2 mm) during endoscopic assessment in surgery. (**See Figure, Supplemental Digital Content 1**, which

presents PPE thickness measurement in preoperative PNS CT scans. [*Left*] A study cohort case of thick PPE: anterior PPE thickness greater than 3.0 mm on preoperative coronal-plane CT scans. [*Right*] A case of nonthick PPE, ***http://links.lww.com/PRS/H579***.) This procedure, designed for the removal of bony spurs or the creation of batten grafts from thick PPE, uses a no. 10 surgical blade and is tailored to meet the unique requirements of each case. (**See Figure, Supplemental Digital Content 2**, which illustrates a no. 10 blade and a harvested batten graft, ***http://links.lww.com/PRS/H580***.)

A retrospective analysis was conducted on a cohort of patients who underwent rhinoplasty or septoplasty using the PPE split technique performed by a single surgeon (K.W.K.) between March of 2022 and January of 2024 in the Republic of Korea. A cohort of 36 patients (22 who underwent septoplasty and 14 who underwent rhinoplasty) was included in this study. Preoperative PNS CT scans were used to assess the anteroinferior PPE thickness, which averaged 3.46 mm (range, 3.1 to 3.8 mm). The PPE splitting technique has achieved a high success rate. Specifically, the technique was used in 26 cases for harvesting bony batten grafts, during which graft breakage occurred in 3 cases (12%). These breakage issues were addressed by obtaining grafts from the remaining portions of the PPE septum. In the 10 cases in which the technique was applied for the removal of bony spurs and septal reshaping, no failures or issues were observed. The use of bony batten grafts derived from the PPE significantly improved septal straightening and functionality. In addition, in rhinoplasty procedures, the incorporation of these grafts for septal support notably enhanced aesthetic outcomes. (**See Figure, Supplemental Digital Content 3**, which demonstrates the effectiveness of a bony batten graft from the PPE technique in [*left panels*] correcting a deviated septum in septoplasty and [*right panels*] providing support in aesthetic improvement in rhinoplasty, ***http://links.lww.com/PRS/H581***.) This led to satisfactory improvements in all patients. This technique demonstrated an impressive safety profile, with only 1 reported case of graft displacement that was successfully treated in an outpatient setting. No adverse events or complications were observed.

DISCUSSION

This study introduces a pioneering PPE split technique aimed at the efficient reshaping of the bony septum or the harvesting of PPE grafts for rhinoplasty and septoplasty procedures, offering significant benefits in cases of patients with a thick PPE. First, this method seeks to minimize septal defects by resecting or harvesting a partial septum, thereby preserving half of the PPE. In contrast to the full-thickness PPE resection common in traditional septoplasty, this approach preserves a portion of the interpositional bony septum, thus preventing postoperative complications, such as septal hematoma and septal perforation.

Second, this technique optimizes the procurement of bony grafts to the desired thickness, thereby facilitating the use of additional bony graft materials. Traditional methods often necessitate the reshaping of the harvested graft by drilling down to an optimal thickness of approximately 1 to 1.5 mm to achieve a batten graft, rendering the drilled-out portion unusable. In contrast, this innovative approach involves a one-step splitting and cutting process that achieves half the thickness of the PPE, thereby saving operative time. Furthermore, this method enhances surgical outcomes by enabling the harvesting of 2 batten grafts from the remaining portion. In Asian rhinoplasty, often characterized by weaker cartilage, supportive structural reconstruction is crucial, particularly in cases of augmentation rhinoplasty with septal deviation. Despite the availability of various allograft materials such as polydioxanone plates, autologous grafts present distinct advantages, including safety and lower complication rates. The author prefers using the septal cartilaginous portion for septal extension grafts or spreader grafts because of its elasticity and compatibility with the alar cartilage, whereas the harder bony PPE is used as a batten graft to strengthen the septum or correct deviations.[4] However, in cases of severe or extensive deviations, the septal cartilage is also needed as a batten graft, and the resource materials for augmentation or tip-plasty may become limited. In the context of this strategic approach to selecting materials based on the distinct properties of each graft type, obtaining 2 batten grafts from the PPE can be a significant advantage in cases that require substantial septal support.

Although promising, the PPE splitting technique entails challenges and a notable learning curve. In the author's experience, the 12% incidence of graft breakage during harvesting illustrates the need for precision. Furthermore, using a no. 10 blade as an osteotome requires careful handling to prevent injuring the superoposterior part of the PPE, which poses a risk of cerebrospinal fluid leakage. As demonstrated in Video 1, osteotomy was performed at the safer lower two-thirds of the septum height, thus preserving the superior part intact to further reduce the risks. This approach ensures the safety and efficacy of the procedure. This highlights the importance of meticulous

surgical skills and thorough anatomical knowledge to minimize the risks and fully leverage the benefits of this method. Furthermore, this method should be applied primarily in cases of thick PPE, which are not frequently encountered in clinical practice.

In a study by An et al.[5] on 104 Chinese patients, the authors used PNS CT scanning to report anterior thicknesses of the PPE of 3.14 ± 0.69 mm, 3.13 ± 0.79 mm, and 1.76 ± 0.55 mm at the one-sixth, one-half, and five-sixths points, respectively. Further research involving a more diverse pool of participants is required to validate the applicability and effectiveness of this technique in different ethnic groups. Despite this limitation, in cases of a thick PPE, which is necessary for septal straightening and aesthetic enhancement, the advantages of this technique include its potential as a valuable surgical tool.

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DISCLOSURE

The author has no financial relationships or conflicts of interest to disclose.

PATIENT CONSENT

The patient provided written informed consent for the use of his images.

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