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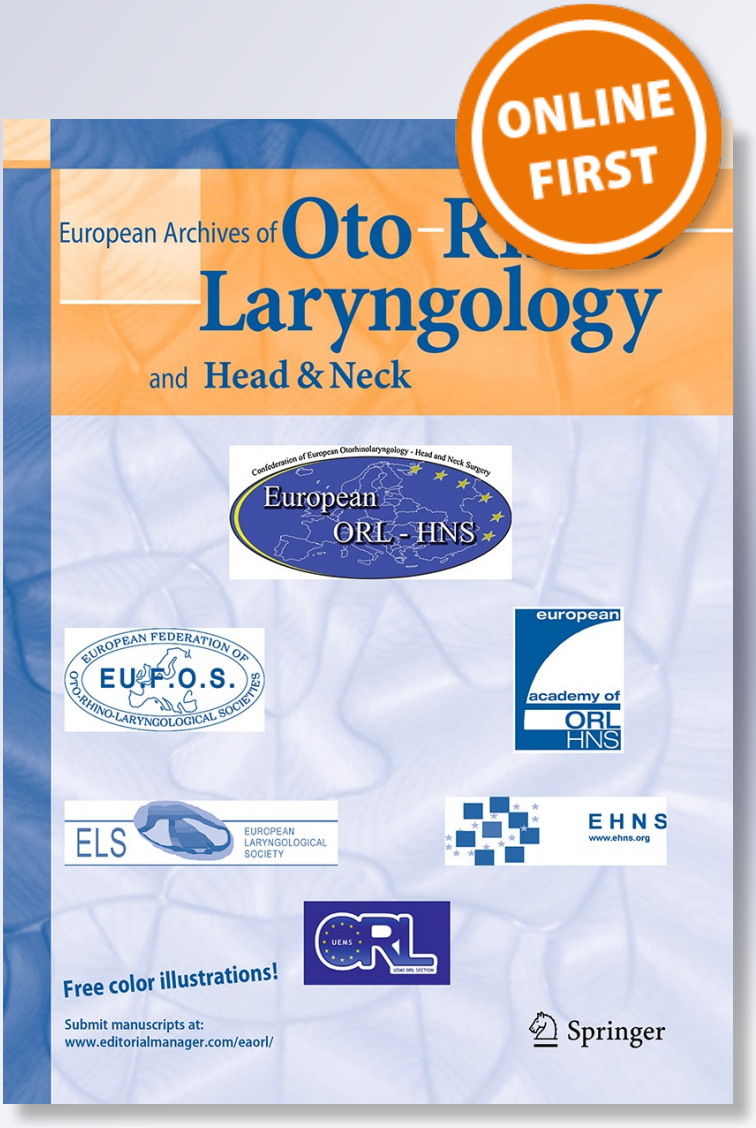

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REVIEW ARTICLE

How effective is postoperative packing in FESS patients? A critical analysis of published interventional studies

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Abstract The present study aimed to assess the clinical effectiveness of absorbable packing alone, non-absorbable packing alone, and absorbable versus non-absorbable packing in the postoperative care of FESS patients, regarding bleeding control, adhesion formation, wound healing, and overall patient comfort. Systematic literature review in Medline and other database sources until July 2013, and critical analysis of pooled data were conducted. Blinded prospective randomized control trials, prospective, and retrospective comparative studies were included in study selection. The total number of analyzed studies was 19. Placing packs in the middle meatus after endoscopic procedures does not seem to be harmful for postoperative patient care. Regarding the postoperative bleeding rate, absorbable packing is not superior to no postoperative packing (strength of recommendation A). Comparing absorbable to non-absorbable packing, the former one seems slightly more effective than the latter in the aforementioned domain (strength of recommendation C). Absorbable packing was also found more effective than non-absorbable packing as a means of reducing the postoperative adhesion rate (strength of recommendation B), and more effective in comparison with not placing any packing material at all (strength of recommendation C). Non-absorbable packing also proves more effective than no postoperative packing in preventing the appearance of such adhesions (strength of recommendation A). Absorbable packing is also more comfortable compared to non-absorbable materials (strength of recommendation A), or no postoperative packing in FESS patients (strength of recommendation B). The comparative analysis between the different packing modalities performed in the present study may help surgeons design a more individualized postoperative patient care.

Keywords FESS · Packing · Absorbable · Bleeding · Adhesions · Pain · Quality-of-life

Introduction

Chronic rhinosinusitis with or without nasal polyps is not an uncommonly encountered ENT disease. According to the EPOS guidelines, chronic rhinosinusitis is considered uncontrolled, when the patient needs long-term antibiotics or systemic corticosteroids (in the last month), or if three or more features of partly controlled chronic rhinosinusitis (nasal blockage on most days of the week, mucopurulent rhinorrhea/postnasal drip on most days of the week, facial pain/headache, impaired olfaction, sleep disturbance/fatigue, diseased mucosa on endoscopy) exist [1].

When medical treatment, including topical, oral steroids, and antibiotics, proves ineffective, the option of surgery can be considered, taking also into account the impact of the patient's symptoms on his/her quality of life.

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Functional endoscopic sinus surgery (FESS) has internationally become the gold standard of surgical treatment for chronic rhinosinusitis, especially in the presence of nasal polyps, aiming at removing any polyps, improving the ventilation of the paranasal sinuses, and reestablishing the drainage through the natural ostia of the sinuses. These objectives are achieved with the use of mucosal sparing techniques, which cause minimal damage, making every effort at the same time to minimize the complication rate, which is inevitably associated with any procedure [2]. The latter events may have a negative impact on patients' postoperative course and lead to recurrence [3]. Hence, both surgery and postoperative care are considered to be very important on determining patient outcomes.

Having said that, there is still lack of consensus regarding the postoperative management of patients undergoing FESS. There are no guidelines regarding both the need to perform nasal packing at the end of the operation, or the materials used for such packs [4]. Some surgeons prefer the use of traditional non absorbable packs [5], some use absorbable packs [6, 7] and others avoid packing the nose [8, 9]. However, most times surgeons have dogmatic views on their preference about nasal packing at the end of endoscopic procedures, usually without any evidence supporting their choices.

The aim of the present study is to assess the clinical effectiveness of absorbable packing alone, non-absorbable packing alone, and absorbable versus non-absorbable packing in the postoperative care of FESS patients, regarding bleeding control, adhesion formation, wound healing, and overall patient comfort, based on a qualitative analysis of published data.

Materials and methods

An extensive search of the literature was performed in Medline and other available database sources until July 2013, establishing two main categories of outcomes:

(a) assessment of the clinical effectiveness of absorbable packing alone, non-absorbable packing alone, and absorbable versus non-absorbable packing, regarding the bleeding rate of patients who had undergone FESS, and (b) assessment of the clinical effectiveness of absorbable packing alone, non-absorbable packing alone, and absorbable versus non-absorbable packing, regarding the appearance of postoperative adhesions, middle meatal patency, and mucosal status in FESS patients.

Using this framework of results, the retrieved studies were critically appraised, according to evidence-based guidelines for the categorisation of medical studies (Tables 1, 2) [10]. In addition, the postoperative discomfort caused by absorbable packing compared to no packing, non-absorbable packing compared to no packing, and absorbable versus non-absorbable packing, was also analysed as a secondary end-point.

During the search the keywords "FESS", "packing", "absorbable", "non-absorbable", "bleeding", "adhesions", "synechiae", "discomfort", "pain" and "quality-of-life" were utilized. The keywords "FESS" and "packing" were considered primary, and were either combined to each of the other keywords individually, or used in groups of three. In addition, reference lists from the retrieved articles were manually searched. Language restrictions limited the search to English-language articles only.

Results

Twenty-four studies met the defined criteria and were initially included in study selection. Among these studies, three were conducted by researchers belonging to the same investigating team. The respective results were included once in the analysis of pooled data to avoid double-counting. In addition, one study reported on the effectiveness and safety of a single absorbable packing material, without comparing the results obtained with any form of baseline outcomes. This study was also excluded from the analysis of data. Finally, two studies reported on the comparative efficacy of two different non-absorbable materials. As the aim of the present study was to highlight the potential outcome differences between different packing modalities and not to compare commercially available absorbable packs, the aforementioned studies were also excluded from data analysis.

Overall, eight blinded prospective randomized control trials, nine prospective comparative, and two retrospective comparative studies referring to the use of packing materials in the postoperative care of patients who had undergone FESS were systematically analyzed (Tables 3, 4, 5).

From the nine studies which compared absorbable to non-absorbable packing in FESS patients, six reported on the postoperative bleeding rate. Significantly reduced bleeding rate in patients with absorbable packing was reported in one level I study, whilst worse respective outcomes compared to patients packed with non-absorbable materials in one level III study. Two level I, one level II, and one level III study did not identify any statistically significant difference in the bleeding rate between the two packing modalities. Among the two level I studies which had not demonstrated statistically significant differences in the bleeding rate between absorbable and non-absorbable packing materials, one had employed the same non-absorbable packing with the aforementioned level III study.

Among the eight studies which compared absorbable to no packing in FESS patients, five level I studies reported on

Table 1 Levels of evidence regarding the primary research question in studies that investigate the results of a treatment (http://www.cebm.net/index.aspx?o=1025)

Category of evidence	Study design
Level I	High-quality randomized trial with statistically significant difference, or no statistically significant difference but narrow confidence intervals
	Systematic review of Level I randomized control trials (and study results were homogenous)
Level II	Lesser quality randomized control trial (e.g. <80 % follow up, no blinding, or improper randomization)
	Prospective comparative study
	Systematic review of Level II studies or Level 1 studies with inconsistent results
Level III	Case control study
	Retrospective comparative study
	Systematic review of Level III studies
Level IV	Case series
Level V	Expert opinion

Table 2 Strength of recommendation by category of evidence for guideline development [10]

Strength of recommendation	Category of evidence
A	Directly based on category I evidence
B	Directly based on category II evidence or extrapolated recommendation from category I evidence
C	Directly based on category III evidence or extrapolated Recommendation from category I or II evidence
D	Directly based on category IV evidence or extrapolated recommendation from category I, II or III evidence

the postoperative bleeding rate. No study had found any statistically significant difference in the bleeding rate between postoperatively packing the nose with an absorbable material and using no packing at all. One level I study reported that immediate postoperative bleeding using absorbable packing was significantly lower than not using any packing material.

Finally, among the two studies which compared non-absorbable to no packing in FESS patients, one level I study reported on the postoperative bleeding rate, and did not identify any respective difference.

All nine studies which compared absorbable to non-absorbable packing in FESS patients dealt with the appearance of postoperative adhesions (and the related patency of the middle meatus), and/or the postoperative mucosal status, thus demonstrating the importance of these issues for the research teams. Significantly decreased postoperative adhesion rate rate in patients with absorbable packing was reported in two level I studies. One level I study showed significantly lower early postoperative granulation tissue formation in patients with absorbable compared to patients packed with non-absorbable materials, whilst one level III study found worse related outcomes. The reported difference in the latter study had become insignificant within the first three postoperative months. Four level I, one level II, and one level III study did not identify any statistically significant difference in the appearance of postoperative adhesions, and/or the postoperative mucosal status between the two packing modalities.

Among the eight studies which compared absorbable to no packing in FESS patients, one level I and three level II studies reported on the appearance of postoperative adhesions (and the related patency of the middle meatus), and/or the postoperative mucosal status. Among these, two level II studies reported lower adhesion rate in patients postoperatively packed with an absorbable material. There was disagreement between researchers regarding the mucosal status and middle meatal patency, with one level I study reporting worse related outcomes in patients with absorbable versus no postoperative packing, and one level I study stating the exact opposite. Nevertheless, early crusting was significantly reduced in FESS patients with absorbable postoperative packing in one level I study.

Finally, both the level I and the level II study, which compared non-absorbable to no packing in FESS patients, regarding the appearance of postoperative adhesions, found worse respective outcomes when no packing material had been employed.

From the nine studies which compared absorbable to non-absorbable packing in FESS patients five reported on the postoperative discomfort. Improved patient comfort and/or preference towards absorbable packing was reported

Table 3 Characteristics of studies comparing absorbable to non-absorbable packing in FESS patients

Authors	Study type	Evidence level	No of cases/packing modality	Follow up	Bleeding rate	Adhesion rate	Other domains	Comments
Wang et al. 2011 [11]	Retrospective comparative	III	162 Patients packed with Nasopore/228 patients packed with Merocel/ 628 patients packed with Vaseline gauze	2/52, 1/12 and 3/12 post-op	Significantly higher postoperative bleeding in the Nasopore group compared to the other 2 groups ($p = 0.03$)	No statistically significant difference between groups	Early granulation tissue formation was higher in the Nasopore group compared to the other 2 groups ($p = 0.004$)	Granulation tissue formation did not differ between groups at 3/12 postoperatively ($p = 0.858$)
Szczygiel-ski et al. 2010 [12]	Prospective comparative	II	30 Patients packed with CMC foam/30 patients packed with latex-coated cotton gauze	1/52, 2/52, 1/12, and 2/12 post-op	No statistically significant difference between groups	No statistically significant difference between groups	Significantly less postoperative pain in the CMC group ($p < 0.0001$)	CMC foam can be recommended after functional endoscopic sinus surgery
Shoman et al. 2009 [13]	Prospective rando-mized controlled	I	30 Nasal cavities packed with Nasopore/30 nasal cavities packed with Merocel	1/52, 1/12 and 3/12 post-op	No statistically significant difference between groups	n.s.	No statistically significant difference between groups regarding postoperative mucosal healing, pain, blockage, or swelling	Nasopore is not superior to traditional non-absorbable packing in any domain studied
Berlucchi et al. 2009 [14]	Prospective rando-mized controlled	I	38 nasal cavities packed with Merogel/37 nasal cavities packed with Merocel	2/52, 1/12 and 3/12 post-op	n.s.	Significantly lower adhesion rate in the Merogel group ($p < 0.001$)	(a) Early re-epithelization was significantly better in the Merogel group ($p = 0.035$) (b) Early granulation tissue formation was significantly lower in the Merogel group ($p < 0.001$)	(a) Differences in healing rates were not found statistically significant when adjusted for multiplicity (b) Merogel is a safe and well-tolerated packing material
Franklin and Wright, 2007 [3]	Prospective rando-mized controlled	I	35 nasal cavities packed with Merogel/35 nasal cavities packed with Merocel	2/52, 1/12 and 3/12 post-op	n.s.	No statistically significant difference between groups	(a) The absorbable group had a trend towards less early scarring, discharge, and crusting (b) The absorbable group had a trend toward improvement in postoperative edema and discharge	(a) 59.3 % of patients with strong preference preferred the absorbable dressing (b) Absorbable dressing is safe and at least equivalent to standard non-absorbable middle meatal dressing

Table 3 continued

Authors	Study type	Evidence level	No of cases/packing modality	Follow up	Bleeding rate	Adhesion rate	Other domains	Comments
Pomerantz and Dutton 2005 [2]	Retrospective comparative	III	16 patients packed with Platelet gel/16 patients packed with Merocel	Every 1-2/52 during the first 2/12 post-op	No postoperative bleeding in either group	No adhesions recorded in either group	No statistically significant difference between groups regarding QoL	(a) Small number of cases precluded potential differences to emerge (b) Platelet gel may be used for cases in which there is a greater than usual need for hemostasis and/or wound healing
Vaiman et al. 2005 [15]	Prospective rando-mized controlled	I	32 patients packed with Fibrin glue/32 patients packed with Merocel	3/7, 2/52, 1/12 and 3/12 post-op	Significantly reduced postoperative bleeding in the Fibrin glue compared to the Merocel group ($p < 0.001$)	No postoperative adhesions reported in either group	(a) Increased pain/nasal pressure/blockage in the Merocel group (b) Increased lacrimation/nasal secretions in the Merocel group	No allergic or inflammatory reactions were observed after the application of Fibrin glue
Bawmann and Caversaccio 2003 [16]	Prospective comparative	II	50 Patients packed with Floseal/50 patients packed with Merocel	2/7, 5/7, 10/7, 20/7, 1/12 and 6-18/12 post-op	No statistically significant difference between groups	No statistically significant difference between groups	(a) High patient satisfaction and comfort in the Floseal (b) Group no postoperative pain/swelling/facial pressure in the Floseal group	(a) Intraoperative hemostasis was rapid and equal in both groups (b) Floseal placement is a safe and efficacious alternative method for hemostasis in FESS
Miller et al. 2003 [17]	Prospective rando-mized controlled	I	37 nasal cavities packed with Merogel/37 nasal cavities packed with Merocel	2/52, 4/52, 6/52 and 2/12 post-op	n.s.	No statistically significant difference between groups	No statistically significant difference between groups regarding postoperative edema, or infection requiring treatment	Absorbable packing may be better accepted and more easily tolerated by patients requiring middle meatal dressing following FESS

n.s. not studied, *QoL* quality of life, *FESS* functional endoscopic sinus surgery

Table 4 Characteristics of studies comparing absorbable to no packing in FESS patients

Authors	Study type	Evidence level	No of cases/packing modality	Follow up	Bleeding rate	Adhesion rate	Other domains	Comments
Wee et al. 2011 [18]	Prospective randomized controlled	II	21 nasal cavities packed with Gelfoam/21 nasal cavities without packing	2/521-4/12 post-op	No statistically significant difference between groups	No statistically significant difference between groups	No statistically significant difference between groups regarding postoperative crusting, granulation tissue formation, purulent discharge, or edema	Gelfoam can be considered a safe and useful absorbable packing material following FESS
Kastl et al. 2009 [5]	Prospective randomized controlled	I	26 nasal cavities packed with CMC gel\foam/26 nasal cavities without packing	2/52, 4/52 and 3/12 post-op	No statistically significant difference between groups	No statistically significant difference between groups	No statistically significant difference between groups regarding postoperative crusting, granulation tissue formation, or infection rate	CMC presents with no appreciable effect on wound healing
Hu et al. 2008 [19]	Prospective randomized controlled	II	60 nasal cavities packed with Meropack/60 nasal cavities without packing	3/52, 2/12 and 3/12 post-op	No statistically significant difference between groups	(a) Early adhesion rate significantly reduced in the Meropack group (b) No statistically significant difference between groups at 3/12 post-op	no statistically significant difference between groups regarding postoperative granulation tissue formation, patency of the ostia, or infection rate	(a) The study involved pediatric patients (b) Meropack dressing effectively prevents postoperative hemorrhage (c) Meropack dressing should be reserved for children predisposed to develop postoperative hemorrhage or adhesions (i.e. large raw traumatic mucosal surfaces, or revision surgery)
Jameson et al. 2006 [20]	Prospective randomized controlled	I	45 nasal cavities packed with Floseal/45 nasal cavities without packing	1/52, 1/12 and 3/12 post-op	No statistically significant difference between groups	No statistically significant difference between groups	(a) reduced discomfort/pain in the Floseal group ($p = 0.027$) (b) Less early crusting in the Floseal group ($p = 0.015$)	Immediate postoperative bleeding ceased quicker in the Floseal group

Table 4 continued

Authors	Study type	Evidence level	No of cases/packing modality	Follow up	Bleeding rate	Adhesion rate	Other domains	Comments
Wormald et al. 2006 [21]	Prospective randomized controlled	I	42 nasal cavities packed with Merogel/42 nasal cavities without packing	2/52, 4/52 and 2/12 post-op	n.s.	No statistically significant difference between groups	No statistically significant difference between groups regarding postoperative edema and infection rate	No detrimental effect from the use of Merogel after FESS was observed
Frenkiel et al. 2002 [22]	Prospective randomized controlled	II	20 nasal cavities packed with Sepragel/20 nasal cavities without packing	Immediate post-op assessment	No statistically significant difference between groups	n.r.	n.r.	Sepragel is effective in stilling postsurgical bleeding, particularly in larger and more exposed postoperative cavities
Kimmelman et al. 2001 [23]	Prospective randomized controlled	II	10 nasal cavities packed with Sepragel/10 nasal cavities without packing	1-5/52	n.s.	Statistically significant reduction in adhesion and stenosis rates in the Sepragel group	Statistically significant improvement in mucosal status and mucosal regeneration in the Sepragel group	Improvement in the early and overall postoperative pain in the Sepragel group
Tom et al. 1997 [24]	Prospective comparative	II	51 nasal cavities packed with Gelfilm/51 nasal cavities without packing	2/52	n.s.	No statistically significant difference between groups	(a) Greater granulation tissue formation in the Gelfilm group ($p < 0.01$) (b) Ostia less frequently patent in the Gelfilm group ($p < 0.05$)	(a) The study involved pediatric patients (b) A second, staged endoscopy 2 to 3 weeks after the initial procedure helps ensure a successful outcome in children (c) Gelatin film stents should be considered only if the child is predisposed to adhesions or has a poor prognostic factor

n.s. not studied, *FESS* functional endoscopic sinus surgery, *n.r.* not reported

in two level I and two level II studies, whilst one level III study did not demonstrate statistically significant differences in this domain.

Among the eight studies which compared absorbable to no packing in FESS patients, two level I and one level II studies reported on the postoperative discomfort. Although

Table 5 Characteristics of studies comparing non-absorbable to no packing in FESS patients

Authors	Study type	Evidence level	No of cases/packing modality	Follow up	Bleeding rate	Adhesion rate	Other domains	Comments
Bugten et al. 2006 [25]	Prospective randomized controlled	I	31 patients packed with Merocel/28 patients without packing	2-3/52 and 1.5-2.5/12 post-op	No statistically significant difference between groups	Significantly lower adhesion rate in the Merocel group ($p = 0.001$)	No statistically significant difference between groups regarding postoperative crusting, discomfort, or infection	Packing in middle meatus for 5 days prevents adhesions significantly better than saline irrigation and topical steroids alone
Shikani, 1994 [26]	Prospective comparative	II	50 nasal cavities packed with Merocel and middle meatal Silicone stents/50 nasal cavities without packing	10/7 and 3-18/12 post-op	n.s.	Adhesions occurred more frequently when no packing was used	n.s.	–

n.s. not studied

one level I and one level II study reported lower pain scores in patients with absorbable versus no postoperative packing, one level I study failed to demonstrate any statistically significant difference in this domain.

Finally, among the two studies which compared non-absorbable to no packing in FESS patients, one level I study reported on the postoperative discomfort, and did not identify any respective difference.

Discussion

In the last 20 years the utilization of endoscopic procedures for the management of chronic rhinosinusitis with or without polyps, as well as for a variety of sinus disorders has increased significantly. Different indications, techniques, and complications of FESS have also been described. Minimizing the intra-operative complications, achieving sustainable improvement in the ventilation of the operated sinuses, avoiding postoperative bleeding and improving patient comfort have become first-line priorities as the operating experience grew, as they are associated with the patients' postoperative quality of life [2].

Middle meatal packs are commonly used in FESS procedures, although this practice is debated by many surgeons. The advantages of middle meatal packs include the promotion of haemostasis, and the prevention of postoperative adhesions and lateralization of the middle turbinate [13, 16, 21]. Nevertheless, conventional non absorbable nasal packing is uncomfortable, and may induce local pain and pressure. Its removal is not always without discomfort, and postoperative bleeding may also occur. Furthermore, complications such as septal perforation, packing dislodgement, aspiration, toxic shock syndrome, and foreign body granuloma have been also reported [1, 20].

In addition to the use of non-absorbable packs, the widespread practice of FESS has promoted the development of absorbable biodegradable packing materials. Absorbable packs are thought to be more comfortable for the patient and do not need to be removed [2, 17].

Nevertheless, a surgeon needs to decide upon the reason for pack placement, before deciding on the appropriate nasal pack (or using no packing at all) [27]. Hence, the present study attempted to critically analyze the use of absorbable packing alone, non-absorbable packing alone, and absorbable versus non-absorbable packing, regarding the bleeding rate, the appearance of postoperative adhesions (and the related patency of the middle meatus), and the postoperative discomfort of patients who had undergone FESS, on the basis of published interventional studies (Table 6). A comparative analysis between the different packing modalities (including not using any packs) may help surgeons design a more individualized postoperative patient care. This, in turn, could improve the patient-surgeon relationship, as, although the ideal Rhinologic patient does not exist, a detailed explanation to the patient about the rationale behind the selection of a specific nasal packing modality is likely to increase his/her respective acceptance [28, 29].

Table 6 Clinical effectiveness of absorbable, non-absorbable, and no middle meatal packing, in three domains relating to the postoperative status of FESS patients (see also text)

Statement about postoperative middle meatal packing in FESS patients	Category of evidence	Strength of recommendation
Absorbable is more effective than non-absorbable packing regarding the postoperative bleeding rate in FESS patients	I	C
Absorbable packing cannot be considered superior to no postoperative packing placement regarding the postoperative bleeding rate in FESS patients	I	A
Absorbable is more effective than non-absorbable packing as a means of reducing the postoperative adhesion rate	I	B
Absorbable packing is more effective in comparison with not placing any packing material at all as a means of reducing the postoperative adhesion rate	II	C
Non-absorbable packing is more effective than no postoperative packing in preventing the appearance of postoperative adhesions	I and II	A
Absorbable packing is more comfortable compared to non-absorbable materials	I and II	A
Absorbable packing is more comfortable compared to no postoperative packing	I and II	B

The clinical effectiveness of absorbable versus non-absorbable packing in the postoperative bleeding rate of FESS patients has not been unanimously demonstrated. Based on the quality of evidence which supported the use of absorbable compared to non-absorbable packing as an effective primary treatment modality, and the lesser quality of the evidence which opposed this outcome, and taking into account the quality of the evidence which did not confirm it, the strength of the extrapolated recommendation can be graded as C. By contrast, all researchers seem to agree that absorbable packing is not superior to no postoperative packing in FESS patients, with regard to the postoperative bleeding rate (strength of recommendation A), although immediate postoperative bleeding using absorbable packing seems to be more quickly ceased. Finally, non-absorbable compared to no packing at all in FESS patients does not seem to affect the postoperative bleeding rate, though the restricted number of studies precludes us from drawing any conclusions regarding the respective strength of recommendation. Hence, with regard to the postoperative bleeding rate in FESS patients, the evidence analyzed in the present study do not overwhelmingly support the use of packing, in sharp contrast with the wide belief about the opposite by most ENT surgeons.

Comparing the clinical effectiveness of absorbable to non-absorbable packing in FESS patients, with regard to the appearance of postoperative adhesions (and the related patency of the middle meatus), and/or the postoperative mucosal status has been an important issue for researchers. Based on the quality of evidence which supported the use of absorbable packing, as opposed to non-absorbable one, as a means of reducing the postoperative adhesion rate, and taking into account the evidence which did not confirm it, the extrapolated strength of recommendation can be graded as B. In contrast, the postoperative mucosal status does not seem to differ between the two packing modalities, at least in the long term. In addition, lower postoperative adhesion rate following the use of absorbable packing has also been demonstrated in comparison with not placing any packing material at all, with an extrapolated strength of recommendation C, considering also the quality of evidence which did not confirm the observed outcome superiority. The total disagreement between researchers regarding the mucosal status and middle meatal patency in the aforementioned patient categories precludes us from drawing any conclusions regarding the respective strength of recommendation. Finally, non-absorbable packing is more effective than no postoperative packing in FESS patients, in preventing the appearance of postoperative adhesions (strength of recommendation A).

The discomfort caused by postoperative packing is a topic which may be associated with patient satisfaction and to some extend with the related postoperative quality of life. Based on the quality of evidence which favored the use of absorbable compared to non-absorbable packing in this domain, and taking into account the evidence which did not confirm it, the strength of the respective recommendation can be graded as A. In addition, absorbable packing is also more comfortable compared to no postoperative packing in FESS patients, albeit with a grade B strength of recommendation. By contrast, no difference in postoperative patient comfort seem to exist between non-absorbable and no postoperative packing in FESS patients, though the restricted number of studies precludes us from drawing any conclusions regarding the respective strength of recommendation.

The potential effect of absorbable or non-absorbable packing on the nasal mucosa has been a case in point in endonasal surgery. Although non-absorbable nasal packing seemed to cause immediate damage to functional indices of the nasal mucosa in a sheep model [30], this does not translate into long-term impairment of mucosal recovery [31]. In addition, not only absorbable packing has not been associated with long-term adverse outcomes [32, 33], but it can also be used as a drug delivery system postoperatively [27], although such efforts have failed to show any benefit so far [34, 35]. Hence, both clinical and experimental studies suggest that placing packs in the middle meatus after endoscopic procedures cannot be considered harmful for postoperative patient care.

Limitations of the present study include the inclusion of different materials in the absorbable and non-absorbable packing categories, which in some way increases sample heterogeneity, and to some extend reduces the strength of the respective recommendations. Nevertheless, the primary aim of the study was to highlight the potential outcome differences between different packing modalities, and not to demonstrate the potential superiority of one commercially available pack belonging to a given category over its counterpart of the same category. In addition, some outcomes of interest e.g. wound healing, granulation etc., represent very individualized processes, and the respective comparisons even regarding similar packing modalities should be interpreted with caution.

Conclusion

Middle meatal packs are commonly used in FESS procedures, to avoid complications which may have a negative impact on patients' postoperative course and lead to recurrence.

Both clinical and experimental studies suggest that placing packs in the middle meatus after endoscopic procedures cannot be considered harmful for postoperative patient care. With regard to the postoperative bleeding rate in FESS patients, the evidence analyzed in the present study do not support the use of packing (strength of recommendation A). However, if we compare absorbable to non-absorbable packing, the former one seems slightly more effective than the latter (strength of recommendation C). Absorbable packing was also found more effective than non-absorbable packing as a means of reducing the postoperative adhesion rate (extrapolated strength of recommendation B), and more effective in comparison with not placing any packing material at all (extrapolated strength of recommendation C) in the aforementioned domain. Non-absorbable packing also proves more effective than no postoperative packing in preventing the appearance of such adhesions (strength of recommendation A). Absorbable packing is also more comfortable compared to non-absorbable materials (strength of recommendation A), or no postoperative packing in FESS patients (strength of recommendation B).

Surgeons frequently have dogmatic views on their preference about nasal packing at the end of endoscopic procedures, usually without any evidence supporting their choices. Nevertheless, it would be advisable for a surgeon to decide upon the reason for pack placement, before deciding on the appropriate nasal pack (or using no packing at all), a process which frequently involves taking individual patient characteristics and intraoperative findings into account. The comparative analysis between the different packing modalities performed in the present study may help surgeons design a more individualized postoperative patient care.

Compliance with ethical standards

Conflict of interest None declared.

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