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Evaluation of the management of nasal septal haematoma and abscess – a systematic review

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Abstract

Introduction

There is limited evidence on the optimal management of nasal septal haematoma (NSH) and abscess (NSA). This systemic review aims to summarise the management, outcomes and identify gaps in the literature.

Methods

A systematic search of EMBASE, PubMed, CENTRAL, CINAHL was done. We included all studies on management of paediatric and adult patient with NSH or NSA.

Results

A total of 17 articles were included (15 retrospective and 2 prospective) totalling 503 patients. Prophylactic antibiotics is generally used in NSH. Most septal collections were drained under general anaesthetic, and incision and drainage used in all. Quilting sutures, drains and nasal packing or a combination of these surgical techniques were described. Re-collection occurred in 18/503 (3.6%).

Conclusion

Low rates of recollection following incision and drainage is reported. There is a lack of well-designed studies that stratify outcomes and morbidity of NSA and NSH based on mode of treatment.

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Introduction

Nasal septal haematoma (NSH) and nasal septal abscess (NSA) are rare and are defined as collections of blood or pus under the mucoperichondrium and/or periosteum of the nasal septum [1]. The main etiology for NSH is trauma, whilst the majority of NSA are thought to arise from infected NSH [2]. Other rare causes of NSA include infections from the paranasal sinuses, oral cavity, or orbits [3-5]. Spontaneous NSA have also been reported [6]. The rate of NSH and NSA was reported to be 0.9% in a large case series of 2500 nasal trauma cases in children [7]. Main symptoms include nasal obstruction, pain and discharge; clinical examination may reveal a unilateral or bilateral septal swelling [8,9].

Management of a nasal septal collection requires prompt diagnosis and adequate surgical drainage often in conjunction with antibiotics [10,11]. Complications can arise due to delayed or inadequate treatment leading to severe functional and cosmetic sequelae, septal perforation, nasal bridge (saddle nosed) deformity or spread of the infection to the orbit or intracranially [9,10,12-15].

NSH and NSA are rare and are considered in patients presenting with acute nasal blockage and septal swelling, particularly in cases of nasal trauma. Other symptoms include fever, facial pain and rhinorrhoea [16]. Early diagnosis and prompt drainage is imperative to minimise the risk of local and distant complications [8,15]. Whilst significant delays in presentation can have potentially life-threatening complications including intra-cranial infection [12] due to the retrograde venous drainage of the nose [17].

Surgical techniques include needle aspiration, incision and drainage with or without nasal packing, surgical drains and quilting sutures [1,8-15,18-20]. There is a paucity of evidence regarding the optimal management of NSH and NSA, reflected by the absence of established treatment guidelines. Given the rarity of NSH or NSA, the evidence base is largely limited to case reports and small series. There is scope to summate data from individual studies to further characterise this condition, management strategies and treatment outcome. The aim of this review is to report the different types of treatment

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and reported outcomes within the literature in order identify a stronger evidence base for managing NSH and NSA.

Methods

The systematic review was reported as per the PRISMA guidelines (see Figure 1).

Eligibility criteria

All original studies reporting outcomes on patients (paediatric and adults) treated for NSH or NSA. Articles not available in the English language and review articles were excluded alongside case reports (due to a high risk of bias).

Information sources

A systematic review of the following databases: EMBASE, PubMed, CENTRAL, CINAHL from inception up to 31/7/23 was performed. The search terms (septal abscess) OR (septal haematoma) OR (septal hematoma) OR (septal collection) OR (septal seroma) were used across all search fields.

Study records

Titles and abstracts from the initial search were independently screened by two authors (RJ and WJ). The full text for articles identified as potentially relevant was reviewed to assess for eligibility. Data was extracted by both authors to check for accuracy and collated using a standardised data collection proforma. The reference sections of all original articles were hand-searched to identify other potentially relevant articles. The process undertaken is presented in Figure 1.

Data items

Data was collected on the following variables: study details; patient demographics; aetiology of haematoma/abscess, antibiotic use, management information (anaesthetic, intervention, use of packing/drains/quilting sutures), complications and outcomes.

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Risk of bias

The Murad's tool was used to assess quality of all studies included in the review [21]. The maximum quality score a study could have was 5 as per our modified Maurad's tool.

Data Synthesis

Quantitative synthesis of data from individual studies if similarity in study methods and outcome assessment. Otherwise, a formal narrative synthesis on outcomes of individual studies, and discussing relationship between study methods and outcomes.

Results

General demographics

A total of 17 studies (see Table 1) were included in this review: two prospective observational cohort studies [1,12] and fifteen retrospective observational cohort studies [8-11,13-15,18-20]. The management of NSH and NSA were reported in 10 studies, 6 studies reported only NSA cases, whilst one study only reported NSH cases. Overall, the studies included 503 patients:192 patients (38.2%) with NSH and 292 patients (58.1%) with NSA. In one study, the proportion of NSH and NSA was unclear accounting for the remaining 19 patients (3.8%).

Twelve studies provided exact numbers of patients grouped as either paediatric or adult, which included 191 paediatric and 97 adult cases respectively. Four studies did not mention the distribution of paediatric and adults within their studies (totalling 215 patients). The commonest aetiology of NSH or NSA was (293/503, 58.3%). Other causes included idiopathic (58/503, 11.5%), vestibulitis/furuncle 5/503, 1.0%), sinus/upper respiratory tract infection (3/503, 0.6%), iatrogenic (3/503, 0.6%), diabetes (3/503, 0.6%) and there was no mention of an aetiology (138/503, 27.4%).

Use of antibiotics

Ten studies used antibiotics in all patients, including five studies treating NSH & NSA patients, and five studies containing NSA cases only [8-11,14,15]. A further three studies used antibiotics in selected

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cases most commonly in the presence of abscess [12,20,22]. Ali et al, describe the management of NSH patients, and identified 7/13 had an abscess at the time of drainage [22]; These patients were given antibiotics, whilst those with haematoma alone were not [22].

Chukuezi et al used antibiotics based on culture & sensitivity results from evacuated septal material, however, it is unclear if or when empirical antibiotics were administered [12]. In their series, four patients developed brain abscess which the authors attributed to delays presenting to hospital and not through antibiotic use [12].

Tavares et al recommended a first dose of intravenous (IV) antibiotic prior to incision and drainage in a series of NSH (n=1) and NSA (n=29) with Cefalotine (8g), first-generation cephalosporin antibiotic, most frequently prescribed and continued 3-5 days post-drainage followed by oral antibiotics for 7 to 10 days [14]. Sayin et al gave IV Ampicillin-sulbactam (+/- metronidazole in cases of NSA), followed by oral antibiotics on discharge totalling 10 days for NSH and 14 days for NSA[10]. Both Canty et al and Ambrus et al used a variety of antibiotic combinations with the former often favouring IV floxacillin (+/- additional oral or intravenous antibiotic) or oral amoxicillin in patients with NSH & NSA [8]. The latter commonly used intravenous oxacillin or ampicillin, whilst being the only study to use intra-muscular (IM) antibiotics (IM Benzathine) in patients with NSA [15]. Studies by Ngo et al [23], Chen et al [24] and Wasilewska et al [25] used broad spectrum empirical antibiotics such as co-amoxiclav, 2nd generation cephalosporins, metronidazole or clindamycin with culture and sensitivity determining final antibiotic choice in patients with NSA [23,24] or NSH & NSA [25].

In the five studies that administered antibiotics in all cases of NSH, none reported progression to NSA, supporting potential for antibiotics being protective against the development of NSA [8,10,11,14,25]. In Kryger et al study, one patient initially presenting with NSH that progressed to NSA [20]. This was drained and treated with antibiotics, however, it is unclear whether this patient had started antibiotics on initial presentation prior to progression to NSA [20]. No study evaluated routine antibiotics in NSH

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haematoma to prevent abscess formation, however, one study reported a single case of NSH which developed into NSA abscess when initial antibiotics were not given [20].

Treatment and use of anaesthetic

All seventeen studies used incision and drainage as the definitive treatment for NSH or NSA (n=503). No studies reported aspiration of the septal collection as a definitive surgical intervention. Three studies performed pre-operative needle aspiration to confirm the diagnosis prior to incision and drainage [1,10,23].

Incision and drainage was performed under general anaesthetic (GA) in (241/503, 47.9%) and under local anaesthetic (LA) in (65/503, 12.9%). In six studies totalling 197/503 (39.2%) patients, the type of anaesthetic was not clearly stated. Ahmed et al [13] and Ngo et al [23] both performed drainage almost exclusively under local anaesthetic in a population of adults. Several authors specifically recommend drainage under GA within the paediatric population [8,14]. The only study to use sedation was by Jalaludin et al [9] who used pethidine and Promethazine (Phenergan) injections, however, the proportion and age of patients given sedation was not stated.

Method of drainage, use of drains, sutures and packs.

Several studies outlined the type of incision made, including hemi-transfixion [10], J-shaped incision [11], extended modified Killian's incision [23], inferior incision [24] or a vertical incision over area of maximum fluctuance and washout [1].Tavares et al recommend using bilateral mucosal incisions in the presence of bilateral septal swellings [14], however, the authors did not report any further details of their drainage technique. The remaining studies did not accurately describe the operative techniques for surgical drainage. For studies including both NSH and NSA patients, no study described a different surgical drainage technique utilised based on the type of collection found intra-operatively.

A surgical drain was used in ten studies [1,8,10,12,14,15,19,22-24], with eight using a Penrose drain which was removed between 2 to 3 days post-drainage. An established pattern for using a drain was not

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identified with its use for both NSH and NSA. In Canty et al series a Penrose drain was used in only 4/20 patients, without explanation for its use in selected cases [8]. Two of these cases (50%) re-collected with the author concluding a drain was not beneficial [8]. Ali et al identified two re-collections in patients that had Penrose drains and splints placed following drainage [22]. Both were re-drained with a Penrose drain and splints being used again [22]. Other studies using Penrose drains in 53 [1] and 16 patients [19] respectively reported no recollections, whilst Sayin et al had two recollections amongst 68 patients (2.9%) [10]. Chukuezi et al described using a drainage tube which was removed 3 to 4 days post-drainage, but no further details on the specific type of tube and the authors reported no re-collections [12].

The types of nasal packing used following surgical drainage include Merocel packs [18,23], simple gauze [12], finger cots [15], internal nasal splints [10,22], antibiotic laden gauze with or without Vaseline [1,11] and Poviodine impregnated gauze [23]. No studies used absorbable nasal packing, and the packing material was removed between 2 and 7 days after insertion. Several studies used nasal packing, but failed to state the type [8,19,20,24]. Nasal packing was commonly used alongside a septal drain [8,10,12,15,22-24]. All ten studies that placed a drain concurrently used nasal splints or packing. Two studies used intra-nasal packing without a drain [18,20].

Septal quilting sutures were described in two studies [10,13]. Ahmed et al detailed their technique of a continuous quilting suture using absorbable 3.0 dyed vicryl without nasal packing and highlighted the importance of keeping at least 1cm gap between suture points to avoid iatrogenic septal perforation [13]. Sayin et al used absorbable suture material to quilt the septum alongside nasal splints, although the suture material was not mentioned [10].

Recollection, complications, follow-up

Across all studies 18/503 (3.6%) septal collections required repeat drainage (4 haematoma, 6 abscess, 8 haematoma or abscess). The highest rate of re-collection occurred in Tavares et al study involving 7/30 (23.3%) of cases [14]. Of note 13/30 (43.3%) of drainages were performed in the emergency room

(and assumed to be under LA); of these, 93.4% of patients in their cohort had a septal abscess drained at the time [14]. On the other hand Ambrus et al series describe the success of LA drainage which was used in 10 patients without any recollection or complications [15].

Complications from septal collections included; palatal abscess [14], intra-nasal synechiae [14], facial & orbital cellulitis [11,14], septal perforation [9,14], saddle nose deformity [9,13-15,24] and nasal deformity [9,12,15,25]. Whilst other studies divided complications into minor and major sequalae [10,19]. Significant intra-cranial complications were rare (six cases) [11,12,14]. Two studies reported individual cases of frontal empyema [11,14]. Chukezi et al reported four cases of brain abscess (including one case of cavernous sinus thrombosis) resulting in three deaths secondary to NSA [12]. Importantly these patients had significantly delayed presentations to hospital, ranging from 3 to 4 weeks from the onset of symptoms [12]. Other studies reported similar complication rates between patients with NSH and NSA [10]. Canty et al reported a higher rate of cartilage necrosis in patients with NSA [8], whilst Ahmed et al reported saddle nose deformity in all NSA cases albeit the number of which is not clear [13]. Most studies reporting patients with NSH & NSA describe collective complications across both cohorts making it challenging to ascertain the impact the type of septal collection had on the subsequent complication [10,12,14,19,20].

Several authors report reducing nasal fractures (when present) at the time of septal drainage [10,18-20]. Removal of necrotic cartilage and reimplantation at the time of drainage was also described [10,18]. Sayin et al excised necrotic areas of cartilage and reimplanted residual septal cartilage to the defective area with 61.7% of patients developing minor or major sequelae, though rates of septal perforation were not reported [10]. Dispenza et al described two techniques to repair areas of necrotic cartilage, the first using homologous cartilage obtained from a cartilage bank (used in three cases), whilst the second called the mosaic technique utilised multiple small fragments of residual septal cartilage fixed with fibrin glue (used in four cases)[18]. Overall, no septal perforations were reported [18], therefore immediate repair of necrotic septal cartilage may have a role in preventing septal perforation.

The length of follow-up varied between studies. Ali et al had a short median follow-up of one month but reported seven patients developed long-term sequelae [22]. Dispenza et al reported long-term results at 5- and 10-years follow-up; they reported normal development of the face and nasal pyramid in their cohort of seven paediatric patients treated for traumatic septal abscess [18].

Across the 17 articles the median quality score (interquartile range) was 1.5 (0-4), indicating the studies were generally of low quality (Table 2)

Discussion

This review sought to characterise management strategies of NSH and NSA, and their influence on outcomes. Several studies stress the importance of early diagnosis and drainage of NSH and NSA to avoid complications and long-term sequalae [12,20]. NSA often present later than NSH [12,20]. Delays in surgical intervention may lead to progression from NSH to NSA as highlighted by Canty et al reported five cases of missed nasal septal collection later re-presenting with NSA in 4/5 patients [8]. Prompt diagnosis, early surgical drainage and administration of broad spectrum antibiotics in NSA are essential to avoid significant intra-cranial complications that can lead to death [12].

Within the literature antibiotics were commonly used in NSA and NSH [8-12,14,20]. These were often commenced empirically using broad spectrum antibiotics to cover commonly associated organisms including *streptococcus* species, *Haemophilus influenza* and *Staphylococcus aureus* [18,26] and adjusted based on culture & sensitivity results [11]. Samples sent to microbiology were obtained by pre-drainage aspiration to confirm the diagnosis of septal collection or intra-operatively [23,24].The current literature does not identify any significant evidence whether antibiotics are protective in preventing NSH progressing to NSA. Sogebi et al identified risk factors significantly associated with complications from nasal septal collections [11]. These included age >45 years, presence of a co-morbidity, longer duration before presentation, presence of an abscess, and a culture-positive aspirate [11]. Therefore,

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NSA should be aggressively treated through early surgical drainage and antibiotics to minimise potential complications.

Due to the heterogeneity of data, it is unclear whether GA is superior to LA drainage. Rates of recollection and complications related to the anaesthetic technique are confounded by other variables such as presence of abscess and drainage technique which are not controlled for. Incision and drainage under GA within sterile theatre conditions was generally favoured [1,8,10,19,20], although, LA drainage in the emergency room or theatre has also been successfully utilised [13,15]. Factors such as patient age affected the method of anaesthesia with general anaesthesia favoured in paediatric cases [8,14]. Series that describe LA drainage originated from Vietnam [23], Malaysia [9], Pakistan [13], Nigeria [12], Brazil [14] and USA [15]. The choice of local anaesthetic drainage may be influenced by accessibility of healthcare resources such as theatres, general anaesthesia or even the higher costs incurred by patients for GA drainage. Although a direct quantitative comparison between GA and LA was not done, we recommend GA drainage were possible as this is better tolerated by patients and allow a comprehensive drainage and washout.

Quilting nasal sutures, nasal drains and nasal packing/splints on their own or in conjunction with one another have been described in the literature to reduce nasal re-collections. The seven studies that reported cases of re-collection, six studies used either a Penrose drain or nasal packing alone or a Penrose drain in conjunction with nasal packing [8,10,14,15,20,22]. Sayin et al used a Penrose drain, nasal splints and septal suturing but still reported two cases of re-collection [10]. Penrose drains work by allowing free drainage through an open wound [27]. However, this may be counterproductive to reducing anatomical dead space between the septal mucosa or mucoperichondium and underlying septal cartilage to stop re-collections. Quilting sutures of the nasal septum are commonly used in septoplasty surgery to prevent post-operative haematoma and bleeding [28]. Ahmed et al advocated continuous quilting sutures without additional nasal packing, with no cases of recollection [13]; a recommendation also echoed by Canty et al [8]. Septal quilting sutures appear to be effective at reducing anatomical dead space around the septum and consequently the chance of re-collection.

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Rates of recollection following drainage of abscess are generally low, at 3.6% across the literature. Tavares et al had a particularly high rate of re-collection at 43.3% with their cohort consisted almost exclusively of NSA cases [14] . Canty et al also noted re-collections particularly in patients with NSA [8]. Furthermore, in Tavares et al series also half of drainages were performed in the emergency room raising potential contributing factors including environmental sterility, equipment availability and the use of local anaesthesia [14]. Particularly in cases of NSA which may have a higher tendency for re-collection it would be prudent to take all steps to ensure an optimal drainage i.e., within a sterile theatre environment, with good lighting and under general anaesthesia.

This is the first review of its kind to report the existing literature on the management and outcomes of NSH and NSA. The majority of studies were retrospective in nature and were limited by incomplete data sets, and small sample size. Several studies reported outcomes of NSH and NSA patients as a single cohort [1, 8, 10-12, 20], which restricted the assessment of outcomes for these two different entities to allow for direct comparison. There remains a paucity of evidence within the literature regarding aspects of managing septal collections. The following question remains: whether antibiotic use in NSH is protective against the formation of NSA; the optimum antibiotic strategy for NSH and or NSA (including use of IV antibiotics, prophylactic antibiotics in the absence of abscess and length of course of antibiotic); whether GA or LA drainage are as effective; the optimum post drainage techniques that minimises recollection may include quilting suture, drains and packing.

In an era of increasing collaborative research a multicentre prospective study assessing the techniques and outcomes of patients treated for NSH and NSA would form large data sets reflecting the current practices and effects on outcomes. This approach with respect to the management of NSH and NSA may help to shed light on areas of equipoise and potentially inform recommendations for the ideal management of these conditions.

Summary

- Standard management for NSH and NSA involves the use of incision and drainage under general anaesthetic with low rates of recollection (3.6%).
- Described surgical techniques includes the use of quilting sutures, drains and non-absorbable nasal packing.
- Broad spectrum antibiotics is used in the management of NSA and some patients with NSH are given prophylactic antibiotics to prevent infection and abscess formation.
- The evidence base management for NSA and NSH is weak as per quality assessment of original studies.
- There is a lack of studies that stratify outcomes, short- and long-term morbidity in patients with nasal septal abscess and haematoma based on specific treatment modalities to identify optimal management strategies.

Conclusion

NSH and NSA are rare but delays and inadequate treatment can lead to significant local and distant complications. Early drainage is recommended to reduce both early and late sequalae. There remains a lack of high-quality evidence regarding the optimum management. Future prospective multicentre studies would help to strengthen the evidence base for managing nasal septal collections.

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Figure 1 Prisma flow diagram showing the selection process

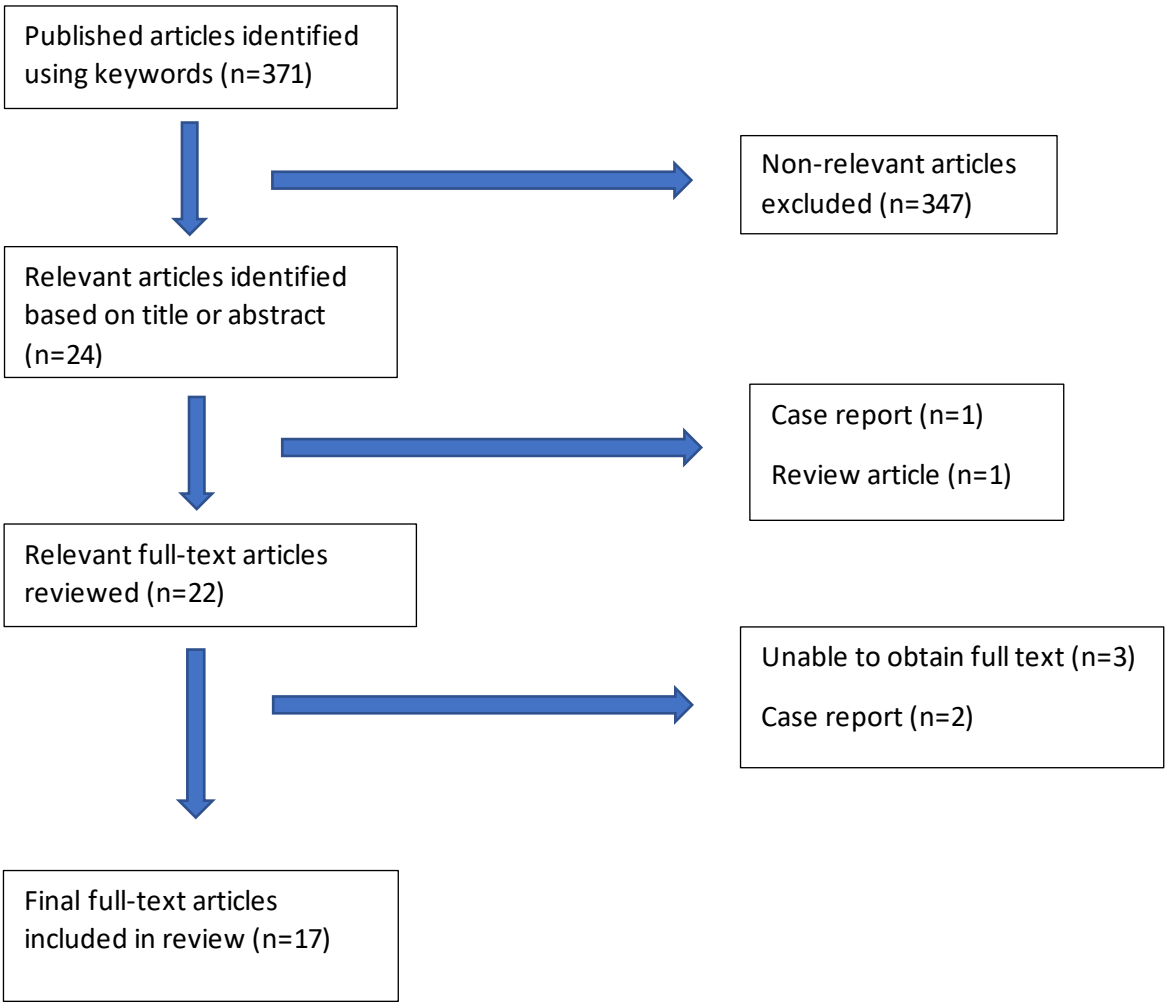

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Table 1 Study characteristics, method of drainage and outcomes

Study	Pathology (n)	Method of drainage	Use of a drain	Nasal packing	Outcome
Ngo, 2023, Vietnam, Adult, Retro N=36	Abscess (36)	A; N=36 I+D; N=36	Poviodine impregnated gauze	Yes (Merocel packs, non-absorbable)	No re-collections or complications
Luan, 2022, Taiwan, Adult, Retro N=76	Abscess (76)	I+D; N=76	No	No	No septal perforations, none required septal surgery
Ali, 2021, USA, Paeds, Retro N=13	Haematoma (13)	I+D; N=13	Yes (Penrose in 3)	Nasal splints in 5	2 re-collections, 7 developed septal abscess. Follow-up 3 had saddle nose deformity, 1 septal deviation, 1 nasal deformity.
Wasilenska, 2021, Poland, Paeds, Retro N=20	Haematoma (11) Abscess (9)	I+D; N=20	No	No	1 re-collection (patient had MRSA). Follow-up 5 had reconstructive septal surgery
Sayin, 2021, Turkey, Adult/Paeds Retro N=68	Haematoma (23) Abscess (45)	A: N=68 I+D: N=68	Yes (Penrose)	Yes (nasal splints)	2 re-collections. 20 minor and 9 major sequelae at follow-up
Sogebi, 2021, Nigeria, Adult/Paeds, Retro, N=24	Haematoma (15) Abscess (9)	I+D: N=24	No	No	No re-collections. Nasal deformity (3), facial-orbital cellulitis (1), intra-cranial complication (1)
Cheng, 2019, Taiwan, Adult, Retro N=6	Abscess (6)	I+D; N=6	Yes (Penrose)	Yes (unclear type)	No re-collections. 2 developed saddle nose deformity
Ahmed, 2016, Pakistan, Adult/Paeds, Retro N=19	Haematoma & Abscess	I+D: N=19	No	No	No re-collections. All cases of sepal abscess developed saddle nose (number unclear)

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Nwosu, 2015, Nigeria, Adult/Paeds, Pro N=53	Haematoma (49) Abscess (4)	A: N=53 I+D: N=53	Yes (Penrose)	Yes (non-absorbable)	No re-collections or complications
Dispenza, 2004, Italy, Paeds, Retro, N=7	Abscess (7)	I+D: N=7	No	Yes (non-absorbable)	No re-collections or complications
Tavares, 2002, Brazil, Adult/Paeds, Retro N=30	Haematoma (1) Abscess (29)	I+D: N-30	Yes (Penrose – 25)	Yes	7 re-collections. 8 other complications identified.
Alvarez, 2000 Mexico, Paeds, Retro N=16	Haematoma (7) Abscess (9)	I+D: N=16	Yes (Penrose)	Yes	No re-collections. 10 minor complications and 6 major complications.
Canty, 1996, Australia, Paeds, Retro, N=20	Haematoma (8) Abscess (12)	I+D: N=20	Yes (Penrose – 4)	Yes	3 re-collections (all septal abscess). Septal abscess had high rates of cartilage necrosis. 5 needed future corrective nasal surgery.
Jalaludin, 1993, Malaysia, Adult/Paeds, Retro N=14	Abscess (14)	I+D: N=14	No	No	No recollections. 2 cases saddle nose deformity secondary to septal perforation
Chukuezi, 1992, Nigeria, Adult/Paeds, Pro N=46	Haematoma (38) Abscess (8)	I+D; N=46	Yes (drainage tube)	Yes (gauze)	No re-collections. 4 cases of nasal deformity or restricted nasal airway
Kryger, 1987, Denmark, Adult/Paeds, Retro N=39	Haematoma (27) Abscess (12)	I+D; N=39	No	Yes (type unclear)	1 re-collection. 8 had septal necrosis, 14 developed nasal obstruction requiring surgery in 6 patients
Ambrus, 1981, USA, Adult/Paeds, Retro N=16	Abscess (16)	I+D; N=16	Yes (Penrose)	Yes (non-absorbable)	2 re-collections. 3 developed saddle nose deformity and 1 had deviated nasal septum

Retro, retrospective; Pro, prospective; N, Number; A, aspiration; I+D, incision and drainage;

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Table 2 Modified Murad's tool – quality assessment applied to studies within literature review

Study	1. Selection	2. Ascertainment Exposure	3. Ascertainment Outcome	4. Causality	5. Reporting	Total
Ngo	0	1	0	1	1	3
Luan	0	1	0	0	0	1
Ali	1	0	0	1	0	2
Wasilenka	0	0	0	0	0	0
Sayin	0	1	0	1	1	3
Sogebi	0	1	0	1	1	3
Cheng	0	1	0	1	1	3
Ahmed	1	1	0	0	1	3
Nwosu	1	1	0	1	1	4
Dispenza	0	0	0	1	0	0
Tavares	0	0	0	0	0	0
Alvarez	0	0	0	1	0	1
Canty	1	0	0	0	1	2
Jalaludin	0	0	0	0	0	0
Chukuezi	0	0	0	1	1	3
Kryger H	0	0	0	1	0	1
Ambrus P	0	0	0	0	0	0

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