

Intranasal cautery for the management of adult epistaxis: systematic review

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Abstract

Background: Cauterisation techniques are commonly used and widely accepted for the management of epistaxis. This review assesses which methods of intranasal cautery should be endorsed as optimum treatment on the basis of benefits, risks, patient tolerance and economic assessment.

Method: A systematic review of the literature was performed using a standardised methodology and search strategy.

Results: Eight studies were identified: seven prospective controlled trials and one randomised controlled trial. Pooling of data was possible from 3 studies, yielding a total of 830 patients. Significantly lower re-bleed rates were identified ($p < 0.01$) using electrocautery (14.5 per cent) when compared to chemical cautery (35.1 per cent). No evidence suggested that electrocautery was associated with more adverse events or discomfort. Limited evidence supported the use of a vasoconstrictor agent and operating microscope during the procedure. The included studies had considerable heterogeneity in terms of design and outcome measures.

Conclusion: Consistent evidence suggests that electrocautery has higher success rates than chemical cautery, and is not associated with increased complications or patient discomfort. Lower quality evidence suggests that electrocautery reduces costs and duration of hospital stay.

Key words: Epistaxis; Cautery; Electrocoagulation; Therapy

Introduction

The use of cautery is well established for the treatment of epistaxis, with a wealth of literature discussing the merits of cautery and its use within acute epistaxis management protocols.^{1–3} There is also extensive literature describing various nasal cautery technical tips, to aid visualisation of bleeding sites,^{4,5} to provide easier access to bleeding points,^{6–9} and to minimise complications such as skin staining with silver nitrate.¹⁰

Despite this, no clear evidence-based guidelines exist relating to the appropriate indications for, or efficacy of, specific cautery techniques used in the management of adult patients presenting with epistaxis. Current clinical practice is mostly based on personal experience, prior training and equipment availability, without any clear evidence base, and with a lack of standardisation of care and significant variability in practice.

The two principal methods of nasal cautery used are chemical cautery and electrocautery. The types of electrocautery available are variable, but include monopolar and bipolar diathermy. Silver nitrate sticks are the most common form of chemical cautery used in the UK. Nasal cautery is often considered to be preferable to nasal packing in light of patient benefits, which

include reduced morbidity and discomfort, and health economic benefits, including the potential avoidance of hospital admission.¹¹ However, a short review of the literature published in 1999 found a lack of studies directly comparing the interventions.¹² Electrocautery is often considered to be superior to chemical cautery, although the evidence base for this in adults has not been clearly established.¹³

Aims

This review aimed to address the following key clinical questions that were identified relating to intranasal cautery: what are the failure rates of chemical cautery and electrocautery?; when should intranasal cautery be attempted?; which methods of intranasal cautery should be endorsed as optimum treatment on the balance of benefits, risks, patient tolerance and economic assessment?; who should perform intranasal cautery?; and does the use of pharmaceutical adjuncts or visual enhancement during cautery affect epistaxis control?.

Materials and methods

This work forms part of a set of systematic reviews designed to summarise the literature prior to the

generation of a UK national management guideline for epistaxis. This review addresses a single research domain: intranasal cautery. A common methodology has been used in all the reviews, described in the first of the publications.¹⁴ Studies were only included if they primarily included patients aged 16 years and above treated for epistaxis within a hospital environment. The search strategy can be found in the online supplementary material that accompanies this issue.

Results

Eight studies were included for analysis in the cautery review.^{11,13,15–20} Figure 1 illustrates the search and article selection process. A summary table (Appendix I) provides details from each of the included studies. Five studies, including one randomised controlled trial, compared the failure rates of either chemical cautery, electrocautery or packing,^{13,15–18} as summarised in Table I. Two studies were identified that included data on treatment costs, as shown in Table II.^{11,16} One study included a comparison of patient discomfort for different treatment methods.¹¹ One study investigated the benefits of using an operating microscope to aid cautery,¹⁹ and one assessed the failure rates of cautery using different topical pharmaceutical agents prior to cautery.²⁰

Summary of evidence

Chemical cautery versus electrocautery

Three studies specifically compared chemical cautery and electrocautery (Table I). Toner and Walby performed

a study on 119 adult patients, and compared the effectiveness of hot wire cautery with silver nitrate cautery.¹³ Cautery was performed after a mixture of 4 per cent lignocaine and 1:1000 adrenaline was applied to the nasal mucosa on wool pledgets. At a two-month follow-up appointment, the recurrence rate, severity and other complications were measured. Of the initial 119 patients treated, only 97 attended follow up and were included in data analysis. The high rate of loss to follow up (18.5 per cent) may have led to the overestimation of epistaxis failure rates in both cautery groups. The study concluded that there was no significant difference between the two cautery methods in patients with recurrent epistaxis ($p = 0.09$). However, group sizes were relatively small and unbalanced (hot wire, $n = 43$; chemical cautery, $n = 54$), and the power calculation performed was based on a predicted chemical cautery success rate of 50 per cent, when the study found that it was actually 70 per cent. This may have led to the study being too underpowered to identify any difference in outcome.

Soyka *et al.* used data from a larger prospective study to investigate the effects of aspirin on epistaxis.¹⁵ It included 397 patients treated with bipolar cautery and 73 treated with silver nitrate cautery. Patients were managed according to the preferences of the treating doctor, and no details were provided regarding the nasal preparation or cautery methods used. Immediate failure was defined as further bleeding within 24 hours of treatment, and recurrence as re-bleeding within 4 weeks of treatment. Fisher's exact test revealed significantly lower immediate failure rates with the use of bipolar cautery when compared to chemical cautery

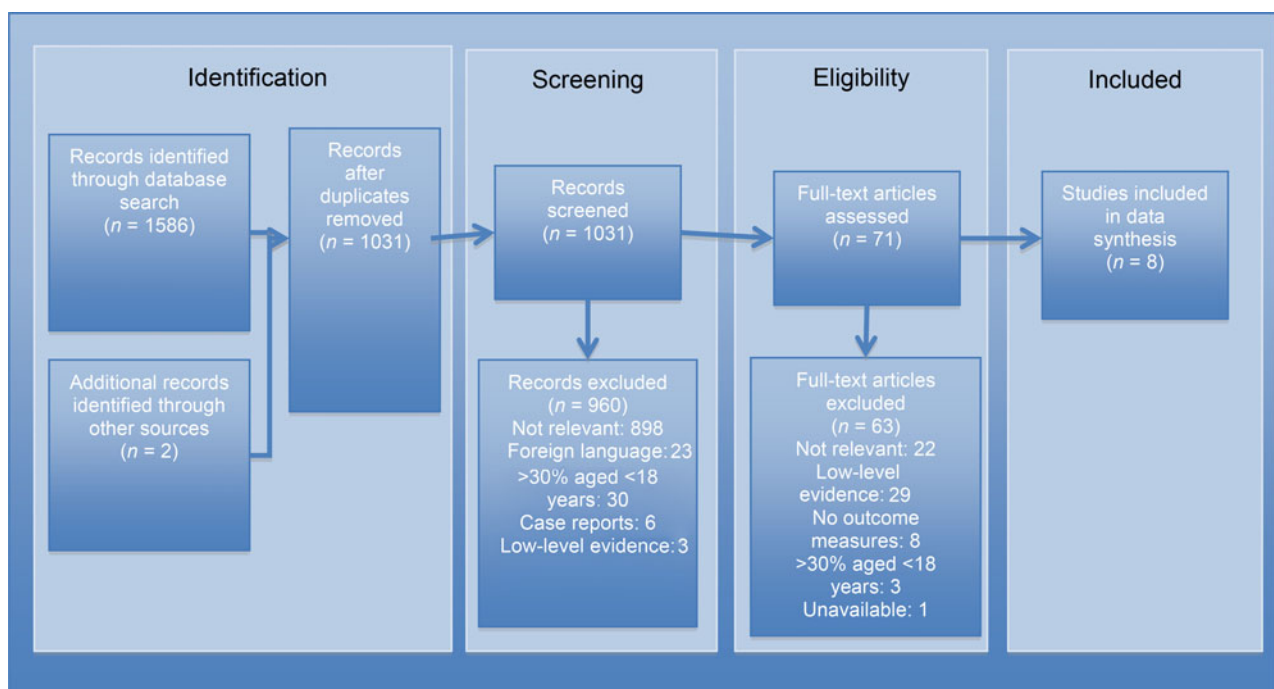


FIG. 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses ('PRISMA') diagram for the cautery review, mapping the number of records identified, included and excluded during different review phases.

TABLE I
COMPARISON OF CHEMICAL CAUTERY, ELECTROCAUTERY AND PACKING FAILURE RATES

Study (year)	Evidence level	Bias grade	Outcome measure	Failure rates (%)			Conclusion
				Chemical cautery	Electro-cautery	Packing	
Toner & Walby ¹³ (1990)	2B	N/A	Recurrence within 2 months	30	23	N/A	No significant difference (underpowered study)
Soyka <i>et al.</i> ¹⁵ (2011)	2B	16	Treatment failure: immediate or within 4 weeks	22	12	N/A	Significantly lower failure rates with electrocautery ($p = 0.04$)
Henderson <i>et al.</i> ¹⁶ (2013)	2C	18	Failure to control bleeding (nasal packing required)	56	22	N/A	Significant reduction in frequency of nasal packing with electrocautery ($p < 0.01$)
Ando <i>et al.</i> ¹⁷ (2014)	2C	15	Recurrence within 2 weeks	N/A	6.4	40.7	Significantly lower recurrence rates with electrocautery vs packing in posterior epistaxis ($p = 0.04$)
Shargorodsky <i>et al.</i> ¹⁸ (2013)	2C	13	Treatment failure: immediate or within 7 days	24	N/A	57	Significantly lower failure rates with chemical cautery vs nasal packing ($p = 0.01$)

N/A = not applicable

($p = 0.04$). Ninety per cent of individuals treated with electrocautery were recurrence-free at 12 days using Kaplan–Meier analysis, compared to 90 per cent at 3 days using chemical cautery.

Henderson *et al.* compared the treatment failure rates before and after implementation of a treatment protocol which recommended the use of bipolar cautery when previously chemical cautery was used.¹⁶ Treatment failure was defined as the need for immediate nasal packing. Sixty-three patients were treated with chemical cautery prior to the introduction of electrocautery, and 61 patients were treated with electrocautery after. The study identified a significant reduction in failure and therefore admission rates ($p < 0.01$). However, the use of bipolar cautery was part of a new treatment protocol; therefore, electrocautery effectiveness may have been overestimated via other protocol changes and the possibility of improved training.

Although the types of electrocautery used and precise definitions of treatment failure varied between studies, it was determined that they were similar enough to pool the data for further analysis. Thus, 830 patients' data were pooled from the 3 studies. The weighted mean failure rate was 14.5 per cent for electrocautery and 35.1 per cent for chemical cautery. Analysis using a chi-square test revealed a significantly lower failure rate for electrocautery when compared to chemical cautery ($p < 0.01$, $\chi^2 = 133.0$).

Cautery versus nasal packing

Two articles compared forms of cautery to nasal packing (Table I). Ando *et al.* primarily investigated the risk factors for recurrent epistaxis, with a focus on the initial treatment.¹⁷ This retrospective study included 101 patients with active posterior bleeding. There was a significantly lower recurrence rate ($p = 0.04$) when patients underwent electrocautery (6.4 per cent) compared to packing (40.7 per cent).

Shargorodsky *et al.* conducted a retrospective study of 147 adult patients who either received silver nitrate cautery or nasal packing (comprising different forms of non-dissolvable packing).¹⁸ Treatment failure was defined as recurrence requiring intervention within 7 days or the immediate failure to control bleeding. Significantly lower failure rates ($p = 0.01$) occurred following treatment with chemical cautery (24 per cent) when compared to nasal packing (57 per cent).

Both studies had significant potential selection bias, with some patients in whom cautery had failed subsequently going on to be packed. Therefore, although packing was associated with higher rates of recurrence, this was likely related to the type of bleed that requires packing (e.g. posterior or heavy bleeding, or associated with anticoagulation), rather than packing directly causing an increased recurrence risk. A comparison of failure rates between the studies is shown in Table I.

TABLE II
TREATMENT COST COMPARISON

Study (year)	Evidence level	Bias grade	Findings
Henderson <i>et al.</i> ¹⁶ (2013)	2C	18	£117 saving per patient with introduction of bipolar cautery
Nikolaou <i>et al.</i> ¹¹ (2013)	2B	16	CHF 150 (approx. £106) saving per patient with bipolar cautery vs packing. No significant difference in median costs for bipolar vs chemical cautery

CHF = Switzerland Francs

Impact of cautery on admissions, costs and hospital stay

Henderson *et al.*, in addition to assessing the failure rates of electrocautery and chemical cautery (as shown in Table I), also investigated the admission rates and costs associated with the techniques.¹⁶ Analysis was performed following the introduction of a new protocol that included electrocautery (as discussed above). Admission rates decreased significantly ($p < 0.01$) from 62 per cent to 37 per cent, with associated savings calculated at £117 per patient.

Similar cost savings were identified by Nikolaou *et al.*, who performed a prospective study to investigate the treatment costs of chemical cautery, bipolar cautery and Rapid Rhino[®] packing.¹¹ The study, performed in Switzerland, included a cost analysis conducted on 96 patients. Based on a currency exchange from Swiss francs to British pounds accurate at the time of the study, the authors reported savings of approximately £106 per patient treated with bipolar cautery when compared to Rapid Rhino packing ($p < 0.01$). These findings are summarised in Table II.

However, the method of cost calculations used lacked detail in both studies, which created potentially significant bias, limiting their reliability. Furthermore, none of the included studies assessed the optimum use of cautery or patients' tolerance of the procedures.

Patient tolerance

Nikolaou *et al.* collected visual analogue scale (VAS) scores investigating patient discomfort following epistaxis treatment from 84 participants.¹¹ The median VAS score was 2.0 for bipolar cautery, 1.5 for chemical cautery and 6.0 for Rapid Rhino insertion. There was no significant difference identified between cautery methods ($p = 0.7$), but packing was found to be significantly more painful than cautery ($p < 0.01$). Although there were clear differences between the packing and cautery groups, the relatively small sample size for comparison between the chemical ($n = 14$) and bipolar ($n = 40$) cautery groups may have increased the chance of a type II error.

Appropriate practitioners

There were no studies identified that investigated differences in success rates or complications between the grade, level of training, or type of healthcare professional performing cautery.

Adjuncts to cautery

Multiple studies were initially identified within the literature search that investigated the success rates of posterior epistaxis treatment using either microscopy or nasoendoscopy. However, as most of these were case series, they were excluded from further analysis. Nicolaides *et al.* compared the effectiveness of hot wire cautery performed with an operating microscope to that of conventional treatment without a microscope.¹⁹ Using a microscope improved localisation of the bleeding point (82 per cent vs 57 per cent), improved the arrest of bleeding (82 per cent vs 23 per cent), and significantly reduced the rate of nasal packing ($p < 0.001$) and the length of hospital stay ($p < 0.001$). However, the retrospectively analysed control group included patients treated immediately before the introduction of the new technique, with some treated with silver nitrate, a potential confounding factor. Hence, no conclusions could be drawn regarding the use of visualisation adjuncts to aid epistaxis treatment.

Mattoo *et al.* assessed the effect of applying xylometazoline- or adrenaline-soaked cotton packs for 30 minutes prior to attempting silver nitrate cautery, and compared this to pinching of the nose for 10 minutes.²⁰ The success rate of cautery was measured by the immediate achievement of haemostasis and the absence of recurrence within 4 days. There was a statistically significant improvement in success rates when comparing nasal pinching with xylometazoline ($p = 0.01$), and nasal pinching with adrenaline ($p = 0.001$). There was no significant difference between the use of xylometazoline and adrenaline.

Limitations

The full text of one article was unavailable and therefore could not be included for eligibility assessment. This paper was published almost 30 years ago, and assessed hot wire cautery, which is rarely used in modern practice. The other studies had considerable heterogeneity in their designs and methodology, which limited pooling of data. Additionally, many studies did not randomise treatment and were often evaluations of new treatment protocols, which introduced further potential bias, as they may have included other recommendations and improved the training of treating doctors. As discussed earlier, there is a risk of selection bias, particularly when comparing those

patients treated with packing and cautery in non-randomised studies, as there may be other factors influencing failure or recurrence rates, such as bleeding severity or use of anticoagulants.

Conclusion

There is evidence to suggest that forms of electrocautery (bipolar was the most commonly used) are more effective at treating active epistaxis than chemical cautery. Additionally, limited evidence suggests that electrocautery is not associated with higher complication rates or patient discomfort. There is limited low-quality evidence to suggest that the use of electrocautery reduces the length of hospital stay and treatment costs. In addition, packing is associated with a higher risk of recurrence when compared to any form of cautery, though this finding does not account for possible differences in bleeding severity or location between intervention groups. The application of a topical vasoconstrictor may improve the success rates of cautery. No high-quality studies were identified that compared the effectiveness of adjuncts to epistaxis control, such as the use of a microscope or nasoendoscope.

Future studies in this area should include randomised controlled trials that assess the need for nasal packing when bipolar or chemical cautery are used as a primary treatment, and an analysis of the costs associated with each treatment and treatment failure. Future studies should assess the value of nasal examination and cautery following pack removal (in those who require packing) prior to discharge from hospital.

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APPENDIX I
SUMMARY OF STUDIES INCLUDED IN CAUTERY REVIEW

Study (year)	Method	Participants	Interventions	Outcome measures	Results	Bias grade/results & assessment details
<i>RCT</i> Toner & Walby ¹³ (1990)	<ul style="list-style-type: none"> – Patients were randomised to receive either electrocautery (hot wire) or chemical cautery (silver nitrate) treatment using computer-generated randomisation tables, & sealed envelopes were used in sequence by the treating doctor – A doctor, blinded to treatment method, measured outcomes at 2 months 	<ul style="list-style-type: none"> – 97 patients aged >16 years attending emergency department with acute bleeding from an identifiable anterior source suitable for cautery were included – 43 were treated with electrocautery & 54 with chemical cautery. Patients in both treatment groups had similar demographics 	<ul style="list-style-type: none"> – All cautery was performed under LA with a 50:50 mixture of 4% lignocaine & 1:1000 adrenaline applied on wool pledgets – Electrocautery was conducted using a hot wire; chemical cautery was performed using silver nitrate (no further details given) 	<p>Following outcomes were measured at 2 months:</p> <ul style="list-style-type: none"> – recurrent epistaxis rate, – recurrence severity, – complication rates 	<ul style="list-style-type: none"> – No significant differences in recurrence rates, recurrence severity or complication rates for electrocautery vs chemical cautery – 23% of electrocautery patients had further bleeding, compared to 30% of chemical cautery patients (not statistically significant) – However, prospective power calculation was based on a success rate of chemical cautery being 50% & in fact it was >70%. Therefore, study was underpowered which could explain insignificance of findings 	<p>Cochrane Risk of Bias</p> <ul style="list-style-type: none"> – Random sequence generation: low risk – Allocation concealment: low risk – Blinding of participants & personnel: high risk – Blinding of outcome assessment: low risk – Incomplete outcome data: high risk – Selective reporting: low risk – Other: high risk – Blinding of participants & treating doctor not possible, but doctor assessing outcomes blinded to treatment – Patients lost to follow up (<i>n</i> = 22) excluded from outcome analysis & analysed separately – no preponderance for either group – Underpowered study MINORS; max grade of 24
<i>Non-RCTs with comparators</i> Nicolaidis <i>et al.</i> ¹⁹ (1991)	<p>Comparative study of success rates, nasal packing requirements & length of hospital stay for patients treated with hot wire cautery under operating microscope vs those treated without use of microscope</p>	<ul style="list-style-type: none"> – Adult patients presenting acutely with epistaxis – Study group: prospective series of 33 consecutive patients treated using operating microscope to facilitate hot wire cautery – Control group: 30 patients who received treatment for acute epistaxis immediately prior to introduction of new technique – Similar demographics 	<ul style="list-style-type: none"> – Study group: topical application of 4% cocaine, examination of nose under operating microscope with patient lying on couch & head at 30°. Suction, bleeding point localisation, hot wire cautery with insulated aural speculum held by assistant – Control group: all procedures performed with naked eye using head light illumination. Hot wire & silver nitrate cautery or nasal packing if no bleeding point identified 	<ul style="list-style-type: none"> – Bleeding point localisation – Arrest of bleeding – Nasal packing use – Hospital admission – Length of stay – Complications 	<ul style="list-style-type: none"> – Using microscope, bleeding point was identified in 29/33 patients. Arrest of bleeding was achieved in 82% (27/33) – Without microscope, bleeding point was identified in 17/30 patients. Arrest of bleeding with cautery was achieved in 23% (7/30). Cautery failure occurred in 10/30 patients – Nasal packing was used in 18% in study group vs 77% in control group (<i>p</i> < 0.001) 	<p>Grade: 20</p> <ul style="list-style-type: none"> – Clear aims, appropriate & unbiased endpoints – Adequate follow up – Adequate statistical analysis – Control group analysed retrospectively – potential source of bias – Silver nitrate used in control group but not study group – potential confounding factor

Continued

Appendix I *Continued*

Study (year)	Method	Participants	Interventions	Outcome measures	Results	Bias grade/results & assessment details
Henderson <i>et al.</i> ¹⁶ (2013)	<ul style="list-style-type: none"> - Audit comparing epistaxis management before & after implementation of treatment protocol recommending bipolar cautery use - Before protocol, junior doctors were trained in silver nitrate cautery & packing - Protocol advised use of bipolar diathermy instead of silver nitrate 	<ul style="list-style-type: none"> - Patients with spontaneous epistaxis aged >16 years - Excluded traumatic & post-surgical epistaxis, & patients with inadequate data - 63 patients pre-protocol & 61 post-protocol - No statistically significant difference in demographics between both groups 	<ul style="list-style-type: none"> - For bipolar cautery: suction of clots & application of Co-phenylcaine® prior to cautery - If no bleeding for 2 hours, patients discharged, unless medical or social reasons for admission - If cautery failed, patients treated with nasal packing 	<ul style="list-style-type: none"> - Frequency of nasal packing - Admission rate - Financial assessment 	<ul style="list-style-type: none"> - Hospital admission rate for >24 hours was 27% in study group vs 76% in control group. Mean length of stay was 1.45 days in study group vs 3.56 days in control group ($p < 0.001$) - No significant complications occurred in either group 27/61 patients were treated with bipolar cautery following its introduction vs 0/63 before - Nasal packing frequency reduced from 56% to 22% ($p = 0.0002$) - Admission rates were reduced from 62% to 37% ($p = 0.0068$) - There is potential for a per patient average saving of £117 (£43 345 per year assuming an average of 31 presentations per month) 	<p>Grade: 18</p> <ul style="list-style-type: none"> - Clear aim, appropriate endpoints & follow up - Contemporary & adequate control group - Adequate statistical analysis - Unclear whether consecutive patients included, & whether data collected prospectively or retrospectively - No sample size calculation
Mattoo <i>et al.</i> ²⁰ (2011)	<ul style="list-style-type: none"> - Prospective cohort comparative study - Patients allocated to 1 of 3 groups prior to silver nitrate cauterisation: 10 minutes' nose pinching, 30 minutes' xylometazoline pack use or 30 minutes' adrenaline pack use - Effect of each treatment on haemostasis achievement prior to cautery was analysed 	<ul style="list-style-type: none"> - 150 consecutive adults with spontaneous anterior epistaxis & an identifiable bleeding point - Exclusion criteria: posterior epistaxis, traumatic epistaxis, recent sinusoidal surgery, co-morbidities (e.g. uncontrolled hypertension or diabetes), no bleeding point identified, incomplete follow up - Demographics of treatment groups were not specified 	<p>All patients were examined, clots were suctioned & 10% xylocaine spray was applied to anaesthetise nose. Patients were allocated to:</p> <ul style="list-style-type: none"> - Control group: 10 minutes' nasal pressure, re-examination then silver nitrate cautery if temporary haemostasis achieved - Xylometazoline group: nasal cavity packed with xylometazoline (0.5%) soaked cotton packs for 30 minutes, re-examination then cautery if temporary haemostasis achieved - Adrenaline group: nasal cavity packed with cotton packs soaked in 1:10 000 adrenaline, re-examination then cautery if temporary haemostasis achieved 	<p>Cautery success rates, defined as immediate bleeding control & no recurrence within 4 days</p>	<ul style="list-style-type: none"> - Vasoconstrictor agent use prior to silver nitrate cautery improved cautery success as measured by immediate haemostasis achievement & no further bleeding within 4 days - Success rates were 64% with nasal pinching, 86% with xylometazoline & 90% with adrenaline use prior to cautery - Statistically significant improvement in success rates for nasal pinching vs xylometazoline ($p = 0.01$) & for nasal pinching vs adrenaline ($p = 0.001$) - No significant difference between xylometazoline & adrenaline use 	<p>Grade: 18</p> <ul style="list-style-type: none"> - Clearly stated aim with appropriate endpoints, prospective data collection, consecutive patients - Sample size calculation not performed - Demographics of each group not specified - Unclear how different treatments were chosen – states randomly, but no more details given - Clinicians not blinded to treatments, & treatments were carried out by different clinicians - Follow up complete

<p>Nikolaou <i>et al.</i>¹¹ (2013)</p>	<ul style="list-style-type: none"> – Prospective study investigating pain/discomfort VAS score differences & performing cost analysis for different epistaxis treatment modalities – If a patient received >1 treatment modality, VAS scores were determined for each modality (total of 84 from 61 patients) 	<ul style="list-style-type: none"> – Patients aged >18 years treated for epistaxis with different treatment modalities – For pain/discomfort scores, 61 patients – For cost analysis, 96 patients – Patients with HHT or traumatic epistaxis excluded – Demographics of each group not specified 	<ul style="list-style-type: none"> – All groups: observed for 1 hour after cautery, given antibiotic ointment & reviewed in out-patient department at 4 days – Nose anaesthetised with oxybuprocaine spray before cautery or packing – Anterior bleeds treated with electrocautery or chemical cautery – Posterior bleeds treated with 7.5 cm Rapid Rhino packs, Foley catheter or surgery – Those packed with Rapid Rhino managed as in- or out-patients 	<ul style="list-style-type: none"> – Financial assessment (in CHF) – VAS pain score 	<ul style="list-style-type: none"> – Cost analysis (median costs): bipolar cautery ($n = 36$) = CHF 185.6; chemical cautery ($n = 6$) = CHF 203.0; Rapid Rhino packs ($n = 17$) = CHF 335.6. Significant difference in cost between cautery & Rapid Rhino ($p < 0.01$) – Median VAS score: bipolar cautery ($n = 40$) = 2.0; chemical cautery ($n = 14$) = 1.5; Rapid Rhino packs ($n = 15$) = 6.0. No significant difference in VAS score for electrocautery vs chemical cautery ($p = 0.7$). Significant difference in VAS scores for cautery vs packing ($p < 0.01$) 	<p>Grade: 16</p> <ul style="list-style-type: none"> – Clear aim, with prospective data collection – Inclusion of consecutive patients not specified – Appropriate end points for study aims & clear statistics – Group sizes not equal, but patients were not randomised & this was not the study design
<p>Soyka <i>et al.</i>¹⁵ (2011)</p>	<ul style="list-style-type: none"> – Retrospective cohort study of 537 patients receiving 678 interventions for epistaxis – Data were collected prospectively for consecutive patients in a previous study on aspirin effects on epistaxis; this data set was used for current review (not all patients were on aspirin) – All treatment modalities were compared, with emphasis on treatment failures 	<ul style="list-style-type: none"> – 537 patients treated for epistaxis – 397 patients were treated with bipolar cautery; 73 were treated with silver nitrate cautery – Demographics of separate groups were not specified – Patients with HHT or traumatic epistaxis were excluded – 71% of cases were anterior bleeds. Only 3% of these had packing as first-line treatment; the rest had bipolar or chemical cautery 	<ul style="list-style-type: none"> – All patients were treated according to assessment & preferences of treating doctor, with a treatment algorithm available – For anterior epistaxis, electrocautery or chemical cautery was used; packing was rarely required – For posterior epistaxis, endoscopy was used to locate bleeding point & cauterised if possible; otherwise, patients were packed with a 7.5 cm Rapid Rhino. A Foley catheter was used if Rapid Rhino pack failed, then surgery – No further details about treatment methods 	<p>Treatment failure:</p> <ul style="list-style-type: none"> – Immediate failure defined as further bleeding immediately – Delayed failure defined as further bleeding within 4 weeks of treatment, quoted as 90% recurrence-free rates 	<ul style="list-style-type: none"> – Bipolar cautery was superior to chemical cautery in terms of immediate bleeding control & recurrence prevention – Bipolar cautery ($n = 397$): total treatment failures = 12%, immediate failures = 5%, 90% recurrence-free rate = 12 days – Chemical cautery ($n = 73$): total treatment failures = 22%, immediate failures = 7%, 90% recurrence-free rate = 3 days – Improved failure proportions (immediate & delayed) in electrocautery 	<p>Grade: 16</p> <ul style="list-style-type: none"> – Clear aims – Endpoint suitable & adequately reported – Retrospective analysis – Study groups were not equal in numbers, & demographics of each group not specified – Adequate follow up – High risk of bias as treatment choices were treating doctors' decision (e.g. chemical cautery may only have been used: by inexperienced clinicians, during out-of-hours, on light bleeds or in children)

Continued

Appendix I *Continued*

Study (year)	Method	Participants	Interventions	Outcome measures	Results	Bias grade/results & assessment details
Ando <i>et al.</i> ¹⁷ (2014)	Retrospective study of recurrent epistaxis risk factors, primarily focusing on initial treatment	<ul style="list-style-type: none"> – 299 adult patients followed up 1 week after initial treatment – Patients with trauma, malignancy or HHT, or post-surgery patients, were excluded – 198 cases (66.2 %) were anterior bleeds. 31 cases (10.4%) had an unidentified bleeding point – Haemostatic material used in 27 cases (9%), electrocautery in 234 cases (78.3%) & endoscopic gauze packing in 38 cases (12.7%) 	<p>Initial treatment was divided into 3 groups:</p> <ul style="list-style-type: none"> – Haemostatic material group – Surgicel[®] used for light bleeds – Electrocautery group – bipolar with or without endoscopy; monopolar electrode was used when bleeding difficult to cauterise with bipolar cautery – Endoscopic gauze packing group – packing used when bleeding point could not be identified or electrocautery was difficult 	Risk factors for recurrence of epistaxis within 2 weeks of initial treatment	<p><i>vs</i> chemical cautery statistically significant ($p = 0.04$)</p> <ul style="list-style-type: none"> – Electrocautery use was predictive of a decreased risk of recurrent epistaxis, even for those with relatively minor bleeds – Electrocautery use reduced recurrent epistaxis risk ($p < 0.01$) – On univariate analysis, use of haemostatic material & endoscopic packing, & unidentified bleeding point, increased recurrence risk ($p < 0.01$) – For 101 patients with posterior bleeding, those who underwent electrocautery were at lower risk of recurrence (6.4%) than those who did not (40.7%) 	<p>Grade: 15</p> <ul style="list-style-type: none"> – Clear aim with logical inclusion & exclusion criteria – Appropriate end points – Not able to be blinded as retrospective data collection
Shargorodsky <i>et al.</i> ¹⁸ (2013)	Retrospective analysis of epistaxis patients, to compare outcomes following various treatment methods	<ul style="list-style-type: none"> – 147 adult patients presenting to ENT department with epistaxis – Patients with HHT, trauma, sinus surgery or malignancy were excluded – Patients with insufficient detail recorded in notes or no follow up were also excluded 	<ul style="list-style-type: none"> – Cautery was performed with silver nitrate under local anaesthesia – Packing was performed with Meroce[®], Rapid Rhino, or Epistat[®] (numbers not specified) 	Treatment failure defined as failure to control bleeding immediately or recurrence of bleeding requiring intervention by a physician within 7 days of treatment	<ul style="list-style-type: none"> – Chemical cautery was superior to non-dissolvable packing in terms of failure rates – 36.7% were treated with non-dissolvable packing, with a failure rate of 57.4% – 57.1% of patients were treated with chemical cautery, with a failure rate of 23.8% – Difference between failure rates for cautery <i>vs</i> packing was statistically significant ($p = 0.01$). 	<p>Grade: 13</p> <ul style="list-style-type: none"> – Clear aim – Retrospective analysis; unclear whether consecutive patients included – Appropriate endpoints & follow up – No prospective calculation of sample size – Demographics of each treatment group not specified – Risk of selection bias as patients were not randomised to treatment

RCT = randomised controlled trial; LA = local anaesthesia; MINORS = methodological index for non-randomised studies; VAS = visual analogue scale; HHT = hereditary haemorrhagic telangiectasia; CHF = Switzerland Francs