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Drain-free neck dissection: the use of Artiss fibrin sealant

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Abstract

Objective. To study the safety and efficacy of Artiss fibrin sealant in lateral neck dissection, focusing on drain retention time, length of hospital stay and post-operative complications.

Methods. A retrospective review was conducted of patients who underwent neck dissection in a UK hospital over a 12-month period.

Results. Twenty-three patients were identified; 13 patients had Artiss and a drain, 10 patients had Artiss only. All drains were removed by post-operative day 2. No post-operative fluid collections or complications were recorded. Patients who had Artiss only without a drain were discharged on post-operative day 1.

Conclusion. The use of Artiss reduced the drain retention time and hospital stay, with no post-operative complications. Neck dissection can be safely undertaken with no drain, and can potentially be carried out as a day-case procedure, with the application of Artiss. These findings benefit patients and the National Health Service by improving the patient journey and reducing overall costs.

Main Article

Mr M Bahgat takes responsibility for the integrity of the content of the paper

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Introduction

Neck dissection is a commonly performed head and neck surgical procedure. It involves dissecting out multiple levels of cervical lymph nodes, which allows further pathological staging and treatment of head and neck cancer. According to Hospital Episode Statistics data, 1500 neck dissections are performed within the National Health Service (NHS) in England per year.[1]

Surgical complications occur in 10–20 per cent of patients undergoing neck dissection.[2,3] This can increase to 40 per cent in patients who have had previous radiotherapy to the area or in patients with multiple co-morbidities.[4,5] Common complications include haematoma or seroma formation (which may require a return to the operating theatre), wound infection, and breakdown or dehiscence.

In order to minimise the risk of such complications, a vacuum drain is traditionally used to facilitate adherence of the skin flap to the surgical bed and to prevent haematoma formation. This is removed once the output falls below a level determined safe by the surgeon and the local practice employed. This can take several days and is a major reason for prolonged in-patient stay.[4,5] The use of a surgical drain, however, is associated with risks such as wound infection, pain and drain blockage.[6] A meta-analysis on the use of surgical drains in thyroid surgery showed that drains increased both post-operative pain and infection rates.[7]

Fibrin sealant, such as Artiss (Baxter Healthcare, Newbury, UK), is available commercially, and has been approved by the US Food and Drug Administration (FDA). When it is applied to raw surgical surfaces prior to wound closure, it mirrors the final common stages of the coagulation cascade, thereby facilitating haemostasis. It also promotes early adherence of the skin flap over the surgical bed, reducing the potential space for fluid collections accumulating under the skin. This could mitigate the need for a surgical drain.

Fibrin sealants are being increasingly used across different surgical specialties, with reports of their use in: paediatric surgical procedures,[8] hepatic resections,[9] urological surgical procedures,[10] cardiac surgical procedures[11] and neurosurgical procedures.[12] Fibrin sealants are also increasingly being used in head and neck surgical procedures.

Previously published research from our unit demonstrated Artiss use in parotid surgery, with the conclusion that drain-free superficial parotidectomy could be performed safely and as a day-case procedure.[13] A recent systematic review and meta-analysis by Bajwa *et al.*[14] showed that the use of fibrin sealants in head and neck surgery has promising results in terms of reducing drain output, length of drain retention and hospital stay. However, they note there are a lack of data, particularly in relation to lateral neck dissection.

This paper investigated the safety and efficacy of using Artiss in lateral neck dissection, and considered the possibility of omitting the drain. This would have important positive implications, in terms of patients' care and a significant economic benefit to the NHS.

Materials and methods

A retrospective review of all patients who underwent lateral neck dissection over a 12-month period over 2020 was performed. Length of hospital stay was crucial at that time as it was during the peak of the coronavirus disease 2019 (Covid-19) pandemic. Surgery was performed under the care of up to four specific surgeons in the head and neck unit of the ENT department within a tertiary cancer referral centre. Patients who underwent neck dissection performed by non-ENT surgeons were excluded. Patients who underwent neck dissection in combination with another neck surgery (such as laryngectomy or parotidectomy) were excluded.

Following surgical resection and haemostasis, the wound was closed with interrupted intradermal size 3/0 Vicryl® sutures, except for a short segment where the sutures were left untied, leaving a window into the surgical bed. Artiss fibrin sealant (4 ml vial) was sprayed through this window over the surgical bed using a pneumatised spray applicator. Using Langenbeck retractors, care was taken to apply the aerosol deep to the sternocleidomastoid, under the skin flap and to the corners of the wound. The skin flap was then lowered over the surgical bed and pressure was applied for 2 minutes to allow polymerisation to occur, as per the manufacturer guidelines.[15] The remaining skin edge sutures were carefully tied without pulling the flap off the surgical bed, and LiquiBand® skin glue was applied to the skin. No external sutures, clips or other dressings were applied.

The patients were divided into two groups: one group comprised patients in whom a surgical drain was placed and Artiss applied, and the other group consisted of patients who received Artiss only (without a drain).

All patients were consented regarding the possibility of having a drain. The drain was inserted at the surgeon's discretion. Reasons for drain insertion included: taking anticoagulant or anti-platelet medications, significant co-morbidities, or excessive oozing during the procedure. The drain was removed when output was less than 30 ml at the ward round at 08:00 the next morning. The patients with a drain stayed in hospital until drain removal. Patients without drains were admitted overnight for observation.

Patients were discharged with instructions to contact the ENT department if they developed any wound swelling or signs of wound infection. Patients were instructed to keep the wound dry for one week and then to peel the glue off the wound themselves. Patients were usually followed up in the outpatient clinic two to three weeks after surgery with discussion of histology results, at which time enquiry was also made regarding the occurrence of any wound complications.

The operative records, in-patient notes, discharge summaries and clinic letters were reviewed to record information regarding the time of drain in situ, length of hospital stay and post-operative wound complications.

Results

Twenty-three patients were included in the study: 13 (3 females and 10 males) had Artiss fibrin sealant and a drain, and 10 (3 females and 7 males) had Artiss only (Table 1). The median age of the Artiss plus drain group was 63 years (range, 48–72 years) and the median age of the Artiss only group was 67 years (range, 50–75 years).

In the Artiss plus drain group, seven patients underwent bilateral selective neck dissection (levels II–IV on the therapeutic cancer side and levels II–III on the elective non-cancer side). Six patients underwent unilateral neck dissection only (levels II–IV) and these were salvage neck dissections after radical non-surgical treatment. In the Artiss only group, four patients underwent bilateral neck dissection (levels II–IV on the therapeutic cancer side and levels II–III on the elective non-cancer side) and six patients underwent unilateral neck dissection (salvage unilateral neck dissection of levels II–IV).

In the Artiss plus drain group, the drain output was minimal. The drain was removed on day 1 post-surgery in eight

Table 1. Study results

Parameter	Artiss with drain*	Artiss only†
Patient age (years)		
– Median	63	67
– Range	48–72	50–75
Gender (*n*)		
– Male	10	7
– Female	3	3
Unilateral *vs* bilateral (*n*)		
– Unilateral	6	6
– Bilateral	7	4
Primary *vs* salvage (*n*)		
– Primary	4	4
– Salvage	9	6
Drain retention time, post-op fluid collection & complications	– 8 patients had drain removed on post-op day 1 – 5 patients had drain removed on post-op day 2	No post-op fluid collection was recorded in any patient
Length of hospital stay	– Most patients were fit for discharge once drain removed – One patient stayed 5 days for pain control (related to transoral robotic oropharyngectomy, rather than neck dissection) – One patient developed *Clostridium difficile* infection & stayed in hospital for 7 days	All patients but 1 were fit for discharge on post-op day 1

*$n = 13$; †$n = 10$. Post-op = post-operative

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patients. All patients had drains removed by day 2 post-surgery. In the Artiss only group, no post-operative fluid collection was recorded in any patient. Regarding length of hospital stay, in the Artiss plus drain group, most patients were medically fit for discharge once the drain had been removed. One patient, however, stayed 5 nights in hospital because of post-operative pain; this was related to the transoral robotic oropharyngectomy operation rather than the neck dissection itself. Another patient developed a *Clostridium difficile* infection and stayed in hospital for 7 days. In the Artiss only group, all patients were medically fit for discharge on day 1 post-surgery.

Discussion

Neck dissection has remained essential surgical management for cervical lymph node metastasis in head and neck cancers. Known complications associated with neck dissection include haematoma or seroma formation, wound infections, and dehiscence.[2–5] In order to minimise the incidence of wound complications and fluid collections after neck dissection, surgical drains have been commonly used. Drains, however, do come with risks. They can occasionally become infected, cause pain, reduce post-operative mobility, and are associated with a longer hospital stay. They can get blocked or dislodged, with neck fluid collection, and can cause fistulas. A previous study utilising self-assessment scores, showed that surgical drains significantly increased patients' anxiety and pain, with a reduction in comfort post-operatively.[16]

The fibrin sealant Artiss is available commercially, having been first approved by the FDA for use in facelift procedures, in 2011. Artiss consists of human thrombin, synthetic fibrinolysis inhibitor solution (aprotinin), human sealer protein concentrate and calcium chloride solution. It acts as an adhesive and haemostat.[17]

Several publications have demonstrated the efficacy of fibrin-based sealants in different surgical procedures based on the length of hospital stay.[8–12] A recent systematic review and meta-analysis by Bajwa *et al.*[14] showed that the use of fibrin sealants in head and neck surgery has promising results in terms of reducing drain output, length of drain retention and length of hospital stay. The use of fibrin sealant has been effective in facilitating drain-free parotidectomy in multiple studies. In a randomised, controlled trial by Maharaj *et al.*,[18] adding Tisseel fibrin sealant (Baxter Healthcare), an alternative to Artiss, to parotidectomy significantly reduced mean drainage volume from 65.3 ml to 41.3 ml, and significantly reduced post-operative seroma rates from 22.7 per cent to 3.6 per cent. Cuniffe *et al.* reported a significant reduction in average length of hospitalisation for parotidectomy patients with the introduction of Artiss, from 1.6 days to 0.5 days, with no difference in complication rates compared to drains.[19] Another prospective, randomised trial of 70 parotidectomy patients showed a significant difference in the length of hospital stay, which was 2.3 days in the Artiss plus drain group compared to 1.1 days in the Tisseel group. There was no significant difference in complication rates between the groups.[20] Similar reports have been published for other parotidectomy studies, which show the benefits of adding fibrin sealant in terms of drain output volume and length of hospital stay.[21–24]

We have recently reported similar positive results with the use of Artiss in parotid surgery, which allowed 42.3 per cent of parotidectomy patients without drains to be discharged within 24 hours.[13] This prompted us to change our practice regarding parotid surgery: we currently use Artiss as standard after parotidectomy, without a drain, and surgery is planned as a day-case procedure.

Few published papers, however, have focused on the use of fibrin sealant in neck dissection. This study found a significant reduction in drain retention time (all drains were removed by post-operative day 2) and a reduction in hospital stay following the use of Artiss. Patients who received Artiss without a drain stayed in hospital for 1 night only for observation, and there were no reports of post-operative fluid collection or complications. Artiss can be used safely and effectively in salvage neck dissection procedures, with no increased risks of complications. These results are similar to the findings of Mushi *et al.*, who reported a significantly reduced drainage output and drain in situ time, and a shorter hospitalisation duration (mean of 2.4 days; range, 1–4 days) in selective neck dissection patients using Tisseel.[25]

We also showed that neck dissection can be safely performed without a drain and potentially as a day-case procedure. There is now a bigger push for day-case surgical procedures, focusing on a patient-centred service and minimising costs associated with hospitalisation. Getting it Right First Time, a national programme designed to improve the treatment and care of patients, has advocated for a shift towards day-case procedures as the default modus operandi for routine ENT surgical procedures in the UK. Currently, there are only seven procedures where best practice tariffs for ENT day-case procedures are available. As such, there have been several studies exploring the safety and potential cost benefits associated with day-case surgical procedures for more complex procedures.

- Drains have been used to lower risks following neck dissection; this is associated with longer hospital stay, with significant cost implications
- Use of fibrin glue, with haemostatic and adhesive properties, decreases fluid collection and may negate the need for a drain
- This study investigated the safety and efficacy of Artiss fibrin sealant in lateral neck dissection surgery
- Artiss use resulted in reduced drain retention time and length of hospital stay, with no post-operative fluid collection or complications
- With Artiss application, neck dissection can be performed without a drain and potentially as a day-case procedure
- These findings will benefit patients and the National Health Service by improving the patient journey and reducing overall costs

The shortened hospital stay also provides additional benefits in the present climate of the Covid-19 pandemic by reducing in-hospital infections. In addition to the clear benefits for the patient, the shortened hospital stay should intuitively lead to cost savings for the NHS. The Department of Health estimates that the average cost of an in-patient bed for 1 day is in excess of £400.[26] Other benefits include reduced in-patient waiting lists and the increased availability of in-patient beds. This will have significant cost implications for the NHS in the post-Covid-19 era.

Limitations

The investigation described herein is a single-centre retrospective study. We are currently conducting a prospective study, with attempts to match patients' demographics, co-morbidity scores and performance status between the two groups. Another limitation of the study is the low number of patients; this is because the study was conducted during the

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year of 2020, when some surgical procedures were cancelled or delayed because of the Covid-19 pandemic. We also excluded those neck dissections performed by non-ENT surgeons, and patients who underwent neck dissection in combination with another neck procedure.

Conclusion

The use of Artiss fibrin sealant represents an effective alternative to a surgical drain following neck dissection. It can be used safely and effectively in salvage surgery, resulting in a significant reduction in drain retention time and in the length of hospital stay. With the application of Artiss, neck dissection can be performed without a drain and potentially as a day-case procedure. These findings will benefit patients and the NHS by improving the patient journey and reducing overall costs.

Competing interests. None declared

References

1 Nouraei SA, Middleton SE, Hudovsky A, Darzi A, Stewart S, Kaddour H *et al.* A national analysis of the outcome of major head and neck cancer surgery: implications for surgeon-level data publication. *Clin Otolaryngol* 2013;**38**:502–11

2 Pellini R, Mercante G, Marchese C, Terenzi V, Sperduti I, Manciocco V *et al.* Predictive factors for postoperative wound complications after neck dissection. *Acta Otorhinolaryngol Ital* 2013;**33**:16–22

3 Masud MK, Ahmad SM, Karim MA, Ferdouse F, Fakir AY, Hanif MA *et al.* Complications of neck dissection at a tertiary level hospital: study of 30 cases. *Mymensingh Med J* 2014;**23**:658–66

4 Mehanna H, Wong WL, McConkey CC, Rahman JK, Robinson M, Hartley AGH *et al.* PET-CT surveillance versus neck dissection in advanced head and neck cancer. *N Engl J Med* 2016;**374**:1444–54

5 VanderWalde NA, Fleming M, Weiss J, Chera BS. Treatment of older patients with head and neck cancer: a review. *Oncologist* 2013; **18**:568–78

6 Reid RR, Dumanian GA. A minimalist approach to the care of the indwelling closed suction drain: a prospective analysis of local wound complications. *Ann Plast Surg* 2003;**51**:575–8

7 Woods RS, Woods JF, Duignan ES, Timon C. Systematic review and meta-analysis of wound drains after thyroid surgery. *Br J Surg* 2014;**101**:446–56

8 Gdanietz K, Gutsche I. The use of fibrin sealant in pediatric surgery. *Acta Chir Austriaca* 1991;**23**:95–9

9 Rees M, Plant G, Wells J, Bygrave S. One hundred and fifty hepatic resections: evolution of technique towards bloodless surgery. *Br J Surg* 1996;**83**:1526–9

10 Evans LA, Morey AF. Current applications of fibrin sealant in urologic surgery. *Int Braz J Urol* 2006;**32**:131–41

11 Barnard J, Millner R. A review of topical hemostatic agents for use in cardiac surgery. *Ann Thorac Surg* 2009;**88**:1377–83

12 Kassam A, Horowitz M, Carrau R, Snyderman C, Welch W, Hirsch B *et al.* Use of Tisseel fibrin sealant in neurosurgical procedures: incidence of cerebrospinal fluid leaks and cost-benefit analysis in a retrospective study. *Neurosurgery* 2003;**52**:1102–5

13 Duffin J, McCaffer C, Pabla L, Lester S. Drainless day case superficial parotidectomy with ARTISS [solutions for sealant]. *Int J Otolaryngol Head Neck Surg* 2020;**9**:194–202

14 Bajwa MS, Tudur-Smith C, Shaw RJ, Schache AG. Fibrin sealants in soft tissue surgery of the head and neck: a systematic review and meta-analysis of randomised controlled trials. *Clin Otolaryngol* 2017;**42**:1141–52

15 Artiss. *Solutions for Sealant. Summary of Product Characteristics*. Vienna: Baxter International, 2011

16 Findik UY, Topcu SY, Vatansever O. Effects of drains on pain, comfort and anxiety in patients undergone surgery. *Int J Caring Sci* 2013;**6**:412–19

17 Yamamoto KT, DeJoseph LM. Efficacy and safety of Artiss fibrin tissue sealant use in rhytidectomy: a review of 120 cases. *Surg J* (*N Y*) 2017;**3**:e69–74

18 Maharaj M, Diamond C, Williams D, Seikaly H, Harris J. Tisseel to reduce postparotidectomy wound drainage: randomized, prospective, controlled trial. *J Otolaryngol* 2006;**35**:36–9

19 Cunniffe H, Wong B, Hilger A, Burgan OT. Drain-free parotidectomy: a pilot study using ARTISS fibrin sealant. *Eur Arch Otorhinolaryngol* 2019;**276**:2025–9

20 Chua DY, Goh CH. Drainless parotidectomies versus conventional parotidectomies: randomised control study on efficacy and safety. *Ann Acad Med Singap* 2016;**45**:513–15

21 Conboy P, Brown DH. Use of tissue sealant for day surgery parotidectomy. *J Otolaryngol Head Neck Surg* 2008;**37**:208–11

22 Al-Qahtani K. Initial experience with hemostatic fibrin glue as adjuvant during drainless parotidectomy. *Saudi Dent J* 2011;**23**:67–71

23 Chudek DA, Wilkie MD, Hampton T, Siau R, Panarese A. The effect of fibrin sealant tissue glue in reducing post-operative collections following parotidectomy. *Eur Arch Otorhinolaryngol* 2020;**277**:2055–9

24 Chorney SR, Ryan JT. Fibrin sealant and parotidectomy wound complications in 100 patients. *Eur Arch Otorhinolaryngol* 2019;**276**:2621–4

25 Mushi E, Kinshuck A, Svecova N, Schache A, Jones TM, Tandon S *et al.* The use of Tisseel™ fibrin sealant in selective neck dissection--a retrospective study in a tertiary head and neck surgery centre. *Clin Otolaryngol* 2015;**40**:93–7

26 Department of Health. Reference Costs 2015-16. In: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/577083/Reference_Costs_2015-16.pdf [10 October 2022]

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