**An Audit of Fifty Patients Receiving ArtissTM Fibrin Sealant in Lateral Selective Neck Dissections**

**Running Title:**

An Audit of Fifty Neck Dissection Patients Receiving ArtissTM

**Key Points**

* ArtissTM is a fibrin sealant used in wound closure of lateral selective neck dissections
* Fifty patients received ArtissTM, and thirty-six patients were included in the control cohort
* We show ArtissTM use reduces the drain retention time and total volume drained
* We show ArtissTM use also reduces the length of hospital stay
* ArtissTM use has the potential to reduce the total cost of patient stay

**Introduction**

Cervical lymph node metastasis is a common mechanism of spread of a variety of malignancies, including primary cancers of the head and neck, and cancers originating from distal sites including the breast, lung and kidneys1, 2. One of the common surgical procedures performed within this group of patients is Neck Dissection. This procedure dissects out the cervical chain of lymph nodes, and allows for further staging and treatment of the disease. Research has indicated that Selective Neck Dissections (SND) can be equally effective to Radical Neck Dissections in the treatment of neck metastases, as well as having the advantage of reduced morbidity3, 4.

During this procedure, a significant skin flap is raised to allow full dissection of the lateral aspect of the neck5. Following the surgery, this must be sutured back into position within the neck, covering the wound. The flap creates a large potential space within the neck, which in turn allows the build up of blood and other fluids within this space. For this reason, a tissue drain is usually put in place to drain any blood or tissue fluid post operatively. This impairs healing, and can be painful and restricting for the patient, as well as increasing the chances of wound infection.

Our department has used a fibrin sealant spray post neck dissection for several years in an attempt to reduce post-operative seroma formation. Our results have been published demonstrating that the use of TisseelTM tissue glue reduced both the length of stay and volume drained when compared to previous surgical groups not receiving tissue sealant6. Since that study was published, our department moved to using a newer BaxterTM product,ArtissTM. ArtissTM is a product designed specifically to aid adhesion of surgical surfaces rather than with the pure goal of haemostasis, which is what TisseelTM was primarily designed for7. ArtissTM functions by gluing two opposing surfaces together using naturally occurring components of the clotting cascade (specifically, ArtissTM contains Fibrinogen, Thrombin, Aprotinin and Calcium chloride). The potential benefits of ArtissTM when compared to TisseelTM include an increased time, of up to one minute, to align the tissue planes before surface adhesion begins.

Bajwa et al., published a systematic review and meta-analysis that evaluated the use of fibrin sealants in head and neck surgery8. They identified that there was a significant reduction in total volume drained across the different studies, and that there was a trend towards a reduction in the duration of the drain remaining in situ and reduction in hospital stay. However, they note that there is a lack of data particularly in relation to lateral SNDs. Therefore, our study aims to provide further data regarding the use of ArtissTM in this setting.

**Methods**

*Ethical Considerations:*

The required information was obtained from electronic patient records at Aintree University Hospital, in accordance with guidelines, and with approval from, the Audit Department at Aintree. Data was anonymised prior to analysis.

*Methods:*

This is aretrospective study of the first 50 consecutive patients undergoing SND on whom ArtissTM fibrin sealant was used. Surgery was performed under the care of up to 5 specific surgeons in the head and neck Department within a tertiary head and neck cancer referral unit. The application of the tissue sealant was standardised as per the manufacturer’s guidelines. Results were compared to 36 patients receiving lateral SND who did not have ArtissTM tissue sealant administered. These patients were operated on by the same surgeons, removing inter-surgeon bias from our comparisons. We excluded patients that had procedures involving mucosal connection to the neck or additional thyroidectomy. Levels of neck dissection included in this study were from level II to level V. Surgery for the patients in which ArtissTM was used was carried out between January 2014 and January 2016, and for the control cohort between June 2006 and January 2016.

ArtissTM was obtained from Baxter Healthcare Ltd., and applied according to manufacturer’s guidelines. During the application, an advantage of ArtissTM over TisseelTM was that it allowed an increased one-minute to align the tissue planes due to the relatively lower concentration of thrombin. Following surgery, the total volume drained was assessed after 12 hours. The standard neck drain policy within the department is if this volume was less than 25ml then the drain would be removed.

Patient notes were examined for the outcomes of drain output volume, time of drain in situ and length of hospitalization. Database building and analysis was performed in Microsoft Excel (Microsoft Corporation, Redmond, WA). Statistical analysis (including the Mann-Whitney *U* Test and Student’s *T* Test) was performed using the Social Science Statistics calculator (http://www.socscistatistics.com/).

*Limitations of the Study:*

This is a purely retrospective cohort analysis, and therefore considered interpretation is required. A randomised control trial would eliminate some of the potential biases that are introduced as a result of this study’s design. Another limitation is the number of patients: whilst the cohorts analysed in this study were sufficient to allow analysis of our main outcomes (as detailed above), they were not sufficient to allow us to investigate complication rates between using ArtissTM compared to no tissue sealant.

The first patient included in the control cohort was operated on in 2006, and the first ArtissTM cohort patient was operated on in 2016. This gap is explained by the fact that prior to using ArtissTM the department was utilising TisseelTM as the sealant of choice (and our control cohort requires patients receiving no tissue glue for analysis). In addition, prior to using TisseelTM, modified radical neck dissections were performed more commonly, and therefore we had to ensure the patients included in the control cohort had undergone procedures that were as similar as possible to the ArtissTM cohort (i.e. SNDs). However, it is important to note the surgeons in both cohorts are the same, and techniques have not changed significantly since the first control cohort patient was operated on. Finally, due to the retrospective nature of the study, and the lack of a preceding pilot study, a power calculation was not performed.

**Results**

Table 1 shows the patient demographics in our two study groups: the group receiving ArtissTM Fibrin sealant and the group receiving no glue. The mean age and age range between the two groups was approximately equal. Three patients in the group receiving fibrin sealant had metastatic thyroid compared to two patients in the control arm. All other patients had oropharyngeal squamous cell cancer. The group receiving ArtissTM fibrin sealant had a higher percentage of male patients than the control group. Finally, the extent of lymph node dissection, indicating the invasiveness of the procedure, was comparable between the two groups.

We showed a significant improvement in several important patient outcomes when using ArtissTM compared to using no glue. Figure 1 shows the average volume drained by the neck drain in patients receiving the glue and in patients without glue. There was a statistically significant reduction in the average total volume drained from 106ml ± 74ml (mean ± standard deviation (s.d.)) in the control group to 45ml ± 38ml in the ArtissTM group (*p* < 0.00001).

Figures 2 shows the duration that the drain remained in situ, and the duration of hospital stay between the two groups. Firstly, Figure 2A shows that the days the drain was in situ reduced from an average of 2.7 ± 1.2 days (mean ± s.d.) in the control group to an average of 1.4 ± 0.6 days in the group receiving ArtissTM (*p* < 0.00001). Secondly, and crucially, Figure 3 shows that the average total duration of hospital stay was significantly reduced in patients receiving ArtissTM compared to those that received no tissue glue. There was a reduction from an average stay of 4.2 ± 3.8 days (mean ± s.d.) with no glue to 2.5 ± 2.3 days with ArtissTM (*p* < 0.01).

**Discussion**

*Synopsis of key/new findings*

This is the first study to investigate the use of ArtissTM in SND. ArtissTM use reduced the drain retention time, and reduced the total volume drained, further improving the patient experience.

*Strengths of the study*

This study provides further evidence supporting the use of ArtissTM fibrin sealant in Selective Neck Dissections. It provides data regarding the first 50 patients to receive this technique in our department, and shows directly how this improvement may improve both the patient experience and the costs of these patients to the NHS.

*Comparisons with other studies*

This provides further support to the findings of a meta-analysis that investigated the outcomes associated with the use of fibrin sealants in head and neck surgery8. In addition, our findings are consistent with a previous randomised control trial investigating the use of ArtissTM versus drain alone in breast cancer patients undergoing axillary node clearance9. That study noted, in similar findings to our results, a significant reduction in total volume drained and length of stay in hospital.

*Clinical applicability of the study*

Our study shows that ArtissTM sealant dramatically reduces the length of patient stay in hospital after Selective Neck Dissection when compared to using no tissue glue. The Department of Health estimates the average cost of an inpatient bed for one day is in excess of £400 [10]. One 2ml vial of ArtissTM costs our department £82.88. Therefore, the use of ArtissTM clearly has the potential to reduce the total cost of hospital stay for patients undergoing SND.

**Conclusion**

ArtissTM tissue sealant use in lateral neck dissections significantly reduced the total volume drained, the drain retention time, and the length of the hospital stay of patients undergoing SND when compared to a control cohort which received no tissue sealant. In addition, we show that ArtissTM provided further benefits over the previous tissue sealant of choice, TisseelTM in terms of ease of use. This work has now led to the development of a multicentre surgical trial (DEFEND) into the use of ArtissTM post lateral selective neck dissection which will aim to expand on the findings of this study.

**References**

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**Table Legend**

Table 1 – Table 1 shows the demographics of the two patient cohorts.

**Figure Legends**

Figure 1 – Figure 1 shows the difference in total volume drained from the wound in the two patient cohorts (\*\*\* *p* < 0.00001).

Figure 2 – Figure 2A shows the difference in the drain retention time between the two patient cohorts (\*\*\* *p* < 0.00001). Figure 2B shows the difference in the duration of hospital stay between the two patient cohorts (\*\* *p* < 0.01).

**Table 1 – Patient Demographics**

|  |  |  |
| --- | --- | --- |
|  | ArtissTM | No Sealant |
| No. Patients | 50 | 36 |
| Male:Female | 35:15 | 20:16 |
| Mean Age | 61 | 61 |
| Age Range | 38-87 | 43-87 |
| Levels of Dissection |  |  |
| - Up to II | 1 (2%) | 0 (0%) |
| - Up to III | 22 (44%) | 14 (39%) |
| - Up to IV | 24 (48%) | 17 (47%) |
| - Up to V | 3 (6%) | 5 (14%) |

**Figure 1**



**Figure 2**

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