Title:

Haemostasis in Head and Neck surgical procedures: Valsalva manoeuvre vs. Trendelenburg tilt

Authors

M. Martinez Del Pero
I. Moumoulidis
L. Brennan
P. Jani

Institution

Department of Otolaryngology-Head & Neck Surgery
Addenbrooke's Hospital
University of Cambridge
Hills Road
Cambridge

Contact details

I. Moumoulidis
Clinic 10, Box 48,
Addenbrooke's Hospital
Cambridge
Tel: 07711 384981
E-Mail: moumoulidis@aol.com

Introduction

Meticulous haemostasis is important in all surgical procedures. However, the head and neck area is particularly susceptible to bleeding due to rich vascular supply in the area. It is prone in forming haematomas which might have severe consequences, such as airway compromise. Various methods have been used in order to obtain adequate haemostasis during operations, such as, suture ligation, the harmonic scalpel[1], surgical clips [2] diathermy, or electrocautery [3]. Moreover, some surgeons advocate the use of fibrin sealants [4], already proven successful in other operations in terms of haematoma formation [5].

Other manoeuvres have been advocated to optimise intra-operative haemostasis, which are less well documented in the current literature. These include the Valsalva manoeuvre and tilting the patient with the head down (Trendelenburg tilt), both of which may reveal occult bleeding vessels by increasing venous pressure. Another technique that is widely used is washing the wound with hydrogen peroxide in order to make bleeding points more evident.

The aim of the study is to compare the use of Valsalva manoeuvre against Trendelnburg tilt, in order to identify bleeding vessels and achieve adequate haemostasis prior to completing surgery. This is particularly important in the head and neck surgical practice by our group where we do not routinely used surgical drains.

Materials and Method

Materials: 50 consecutive major head and neck surgical procedures performed in a regional unit were included in the study. The senior author performed or supervised in all the operated cases.

Technique: After the completion of the surgical resection and performing haemostasis by standard ligation and diathermy techniques, a Valsalva manoeuvre was performed for 45 seconds by applying 30cm PEEP to the ventilatory circuit. During this time, any extra bleeding points were identified and treated with diathermy, or ligatures. Following this procedure, the operating table was inclined with the head down (Trendelenburg tilt) to 30º. In this position any further bleeding vessels were identified again and treated accordingly.

Outcome: The main outcome was to compare which method identified more bleeding vessels. Secondary outcome measures were the size of the vessels identified, classified as diathermised, tied or suture ligated and length of achieving haemostasis by each method. Other data recorded to assess any influence on the results were co-morbidities, complicating features (e.g. mediastinal extension of a tumour). Patients who had drains inserted were identified and the length of in-patient stay recorded.

Data analysis: The data was entered into an access database and the statistical analysis was done using SPSS (Mann-Whitney test and chi-square used for main outcome). The project was registered with the Hospital audit department

Results

Fifty patients were included in the project, 9 males and 23 females. Two patients were excluded, because a sternotomy and a maxillectomy had been performed. This predisposed to bone bleeding and the procedures were not strictly speaking in the neck. The median age was 53 years (range 22-80). 37 (74%) had an ASA of 1. Complicating features of the operation, such as marked neck fibrosis from Riedel's thyroiditis (in 5 patients) and large goitre with retrosternal extension (in 4 patients) were noted. Thyroid resections were the most common operations perfomed. Table 1 shows the number and type of operations in detail.

The total number of bleeding vessels identified in Trendelenburg tilt was significantly greater than when using Valsalva manoeuvre ($p<0.0001$). Figure 1 shows the number of bleeding points identified in all patients using both techniques. In 32 (64%) patients, no bleeding points were identified with the Valsalva manoeuvre technique. Fifteen patients (30%) had only one visible bleeding point and in no patient more than 2 bleeding points were identified. Using the Trendelenburg tilt, bleeding points were identifiable in 34 patients (68%).

All bleeding points found on Valsalva manoeuvre were minor and dealt with using diathermy. In the case of head down (Trendelenburg) position, most bleeding points were dealt with using diathermy (101/113 -89%-). However, there were 12 (11%) bleeding vessels that required ties or stitching. These included the anterior jugular vein punctures when the wound filled with blood as the patient was inclined head down, and another puncture in the internal jugular vein that required stitching. Neither of these bleeding vessels were identified on Valsalva manoeuvre. The haemostasis technique used for each bleeding vessel is shown in table 2.

In terms of time taken to finish haemostasis, using the Valsalva manoeuvre it took 30-60 seconds (median 30 seconds). The limiting factor was that sustained increased positive expiratory end pressure can cause complications. In the case of head down, final haemostasis took 2 to 25 minutes (median 6 minutes -360 seconds-). There were no complications recorded for all surgical procedures.

Discussions

Good haemostasis is important in all surgery, but the risk of haematoma in the head and neck area is particularly important due to the risk of airway compromise. Recently, the use of drains in thyroid surgery has decreased considerably lately, as their use does not benefit the patients' outcome and may increase hospital stay [6,7,8,9]. This makes haemostasis paramount whatever the method used. In our unit we perform a large number of major head and neck procedures, most of those being thyroid cases. The approach to thyroid surgery is in the traditional way of open surgery and diathermy, clips and ties for haemostasis. The senior author does not use drains for thyroid excisions, partial or total, although drains are used neck dissections.

The aim of this study was to investigate a technique which provides adequate identification of any potential bleeding vessels in achieving intra-operative haemostasis. Using the head down position, a significantly higher number of bleeding points were identified, in comparison with Valsalva manoeuvre. The former technique proved more sensitive in identifying bleeding vessels that were not seen before (113/134 bleeding vessels identified). It is worth noting that in five cases, significant bleeding that required stitching or tying was missed using Valsalva manoeuvre. In one patient, the bleeding was from a puncture in the internal jugular vein and was missed by Valsalva technique.

We carried out Valsalva manoeuvre first and then head down as it was current practice in the department. This did not affect the results as the number of patients that had bleeding on Valsalva and none on head down was minimal. The opposite, judging by the results, would not have been true.

There are several reports that Valsalva manoeuvre apart from increasing venous pressure can cause reflux in the internal jugular vein, thus helping to identify any bleeding[10]. The limiting factor using this technique is that sustained increased positive expiratory end pressure can cause complications, such as barotrauma. Therefore, the pressure cannot be held for more than a minute limiting the chances of identifying any potential bleeding vessels.

The reason 30° was used for the Trendelenburg position was that this has been shown to be the optimum diameter for increase in central venous pressure in a previous study by Rex *et al*[11]. However, Clenaghan *et al.* state that at 10° degrees of inclination there is already a significant increase in diameter measured by ultrasound[12]. There is a risk of increasing intra-cranial pressure. Cerebral compromise can be minimised by reducing the time the patient is in Trendelenburg tilt. In our study the time taken on average for haemostasis was only 6 minutes.

The senior author considered more appropriate to measure the bleeding point diameter by the way that was treated rather than numerically. This was thought to be better as it relates directly to the clinical application and is less time consuming. In general terms, any vessel wider than X was tied or repaired with a stitch in the case of the jugular vein. Vessels with a smaller diameter were diathermised. No visible ooze was left untreated.

In conclusion, our results show the difference between Valsalva manoeuvre and Trendelenburg position in finding bleeding vessels at haemostasis significantly favours the latter. It has become our practice to routinely put patients in Trendelenburg tilt only, to check its adequacy before closing the wound. The inclination can be as little as 10° with significant increase in vessel diameter and thus avoid intra-cranial complications.

References

1. Defechereux T, M.M., *Hemostasis and ultrasonic shears for thyroid surgery*. Ann Chir, 2006. **131**(2): p. 154-6.
2. Davidson TM, O.T., *Metallic clips as a time/cost saving adjunct to head and neck surgery*. Head Neck, 1990. **12**(6): p. 500-2.
3. Manouras A, L.E., Antonakis PT, Filippakis GM, Markogiannakis H, Kekis PB, *Electrothermal bipolar vessel sealing system is a safe and time-saving alternative to classic suture ligation in total thyroidectomy*. Head Neck, 2005. **27**(11): p. 959-62.
4. Uwiera TC, U.R., Seikaly H, Harris JR, *Tisseel and its effects on wound drainage post-thyroidectomy: prospective, randomized, blinded, controlled study*. J Otolaryngol, 2005 **34**(6): p. 374-8.
5. Jain PK, S.R., Anderson AD, MacFie J, *Randomized clinical trial investigating the use of drains and fibrin sealant following surgery for breast cancer*. Br J Surg, 2004 **91**(1): p. 54-60.
6. Shandilya M, K.S., Walshe P, Timon C, *Cervical haematoma after thyroid surgery: management and prevention*. Ir Med J, 2006. **99**(9): p. 266-8.
7. Khanna J, M.R., Chintamani, Bhatnagar D, Mittal MK,Sahoo M, Mehrotra M, *Is the routine drainage after surgery for thyroid necessary? A prospective randomized clinical study*. BMC Surg, 2005 **19**(5): p. 11.
8. Lee SW, C.E., Lee YM, Lee JY, Kim SC, Koh YW, *Is lack of placement of drains after thyroidectomy with central neck dissection safe? A prospective, randomized study*. Laryngoscope, 2006 **116**(9): p. 1632-5.
9. Ahluwalia, S., Hannan, SA, Mehrzad, H, Crofton, M, Tolley, NS, *A randomised controlled trial of routine suction drainage after elective thyroid and parathyroid surgery with ultrasound evaluation of fluid collection*. Clinical Otolaryngology, 2007. **32**(1): p. 28-31.
10. Chung, C.P., et al., *Flow volume in the jugular vein and related hemodynamics in the branches of the jugular vein*. Ultrasound Med Biol, 2007. **33**(4): p. 500-5.
11. Rex, S., et al., *Prediction of fluid responsiveness in patients during cardiac surgery*. Br J Anaesth, 2004. **93**(6): p. 782-8.
12. Clenaghan, S., et al., *Relationship between Trendelenburg tilt and internal jugular vein diameter*. Emerg Med J, 2005. **22**(12): p. 867-8.

Table 1. Type of Head and neck procedures performed.

Type of operation	No of patients (%)
1. Total thyroidectomy	7 (14)
2. Thyroid lobectomy	23 (46)
3. Subtotal thyroidectomy	2 (4)
4. Modified radical neck dissection	5 (10)
5. Functional neck dissection	2 (4)
6. Excision of lesion post triangle	2 (4)
7. Submandibular gland excision	2 (4)
8. Branchial cyst excision	2 (4)
9. Operations 1& 5	3 (6)
10. Superficial parotidectomy	1 (2)
11. Total laryngectomy	1 (2)

Table 2. Haemostasis technique used for each modality.

Technique	Bipolar Diathermy	Ties	Stitching
Valsalva (No. of bleeding points)	21	0	0
Head down (No. of bleeding points)	101	8	4

Figure 1: Number of bleeding points identified in patients using Valsalva and Trendelenburg tilt