ORIGINAL ARTICLE

The use of fibrin sealant after total thyroidectomy for benign disease obviates the need for routine drainage. Results of a randomized controlled trial

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Background: Drains are usually left after thyroid surgery to prevent formation of hematoma and seroma in the thyroid bed. This prospective randomized clinical trial was conducted to evaluate the necessity of drainage after total thyroidectomy for benign thyroidal disorders.

Methods: The patients were assigned randomly into two groups (group 1: with suction drain, group 2: fibrin glue). In the study, operating time, postoperative pain, the total amount of intramuscular analgesic administration, hospital stay, complications (such as wound infection, seroma, bleeding, hematoma, recurrent laryngeal nerve palsy or hypoparathyroidism), were recorded.

Results: The drained group (group 1) consisted of 2 men and 48 women with a mean age of 47.76±11.22 years. The non-drained (plus fibrin sealant)(group 2) (comprised of 10 men and 40 women with a mean age of 44.72±11.32 years. There was no significant difference in the gender, age, hormonal status and histopathological results of the patients between the two groups (*P*=0.18, *P*=0.36, *P*=0.28 and *P*=0.40, respectively). The operations performed were total thyroidectomy in all patients. Twenty-five patients (50%) in the non-drained group did not need intramuscular analgesic, whereas 15 patients (30%) did not in the drained group (*P*=0.01). In addition, the mean amount of intramuscular analgesic requirement was significantly less in the non-drained group than in the drained group (*P*=0.02). The complication rates were similar between the two groups. One case of hematoma (2%), two cases of seroma (4%) and three cases of transient hypoparathyroidism (6%) occurred in the non-drained group, whereas one case of hematoma (2%), two cases of seroma (4%), two cases of wound infections (4%) and two cases of transient hypoparathyroidism (4%) occurred in the drained group (*P*=0.69). No patient needed surgical revision or re-operation for any complication and all complications were successfully managed conservatively.

Conclusion: Routine drainage of thyroid bed following thyroid surgery may not be necessary. Not draining the wound results in lesser morbidity and decreased hospital stay. Hippokratia 2011; 15 (3): 247-251

Key words: thyroidectomy, drainage, complications, fibrin sealant.

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Thyroidectomy is one of the most commonly performed operative procedures in general surgery. Most surgeons give into tradition of leaving a drain following thyroid surgery with the hope that this will obliterate the dead space and evacuate collected blood and serum.The main reason is to drain off a possible postoperative haematoma, which may compress the air passages and produce respiratory failure. Although haemorrhage after thyroid surgery is rare, it may be life-threatening and require immediate reoperation[1,2]. This fear prompts to surgeon to use routine drains after any type of thyroid surgery. Although the rate of bleeding might increase in subtotal thyroidectomy or in Graves disease due to vascularised remnant tissue, in fact, postoperative bleeding has been reported as rare as 0.3%~ 1% after thyroidectomy[3]. According to Karayacin et al., routine drainage after thyroid surgery is not necessary and a selective policy can be safely applied[4]. Other investigators suggest that drains may be beneficial only if the dead space is very large or if neck dissection is done[3,4,5,6,7,8,9]. Bergqvist and Källerö believe that drains are of no benefit after thyroid surgery because they can become blocked with clotted blood, and they do not alert the surgeon even if major bleeding occurs[3].

Fibrin glue is a biological adhesive material that is made of human fibrinogen and its multiple components. Fibrin glue promotes wound healing by enhancing homeostasis and angiogenesis, and by stimulating macrophages, which have a role in fibroblast proliferation and collagen production in the wound site[27].

Fibrin sealant has also been shown to be effective in reducing seroma formation in animal models following mastectomy and in reducing drainage after axillary dissection[28,29]. Zucchelli and Silvestri[30] showed that this concentration of fibrin sealant shortened the hospitalization time after prostatectomy. Fibrin glues have been used extensively in head and neck procedures. Fibrin glues have been successfully used to reduce wound drainage and to improve other short-term postoperative results. It has been shown that fibrin glues can decrease the drain output in postthyroidectomy patients[31]. This may corre-

late with decreased postoperative bleeding in outpatient surgery.

The present study aimed to evaluate the necessity of drains after total thyroidectomy for benign thyroid disorders.

Materials and Methods

Patients

Between January 2008 and August 2009, a total of 100 consecutive patients undergoing total thyroidectomy for benign thyroidal disorders were enrolled in this study. Informed consent was obtained from all the patients. The preparation for surgical treatment of the patients included the following tests: ultrasound, determination of free T3, free T4, thyroid stimulating hormone and serum calcium concentration, and fine-needle aspiration biopsy. The status of vocal cords in patients with hoarse voice was checked with a laryngoscope. Patients with cervical lymph nodes metastases requiring neck dissection and those with clinical or laboratory indicators of coagulation disorders were excluded from the study. Patients who were treated with UAS (Ultrasonic dissector) were also excluded from the study. Conventional vessel ligation and tight (conventional technique = CT) were used. Finally, the patients were randomized in two groups, -drained and fibrin sealant (non-drained) - according to the admission protocol number. The randomization was provided by an independent computer consultant. The surgeon was informed on the drains insertion just before wound closure.

Methods

Total thyroidectomy was performed by a uniform technique of capsular dissection. Closed suction drains were placed before wound closure, if the patient was in the drained group. In the drain group a closed suction drain with negative pressure (Romovac®) was brought out through a separate wound. The other 50 patients were operated on without any drain placed. After total thyroidectomy was performed, 6 ml fibrin sealant (CryoSeal FS System, Thermogenesis, Rancho Cordova, USA) was sprayed on to the surgical site and under the flap using a double-barrel syringe and spray tip applicator next, platysma layer of absorbable sutures were placed approaching the two surfaces to close the dead space. The wound was immediately closed, allowing the fibrin sealant to seal the apposed tissues. In the study, operating time, postoperative pain, the total amount of intramuscular analgesic administration, hospital stay, complications (such as wound infection, seroma, bleeding, hematoma, recurrent laryngeal nerve palsy or hypoparathyroidism), ASA scores and clinical data, were recorded. The operating time was defined as the time from the first incision to the last suture placement. Postoperative pain was assessed according to visual analogue scale (VAS) from 0 (no pain) to 10 (worst pain imaginable) on postoperative day (POD) 0 and POD 1, if the patient was not discharged. A standard analgesic protocol was used according to VAS scores. Dipyrone (Sanofi Aventis Co., Istanbul, Turkey) was given intramuscularly when the pain score was five or more and oral paracetamol was given for a pain score of four or less, if necessary. The quantity of analgesics was regulated according to the patients' needs and the total amount of administered dipyrone was noted for each patient. The patients were discharged when there were no complication or when they no longer required intramuscular analgesics, regardless of whether the patient felt enough to discharge, after the drain was pulled, if drained. The volume of fluid collected in the suction drain was measured separately. The drains were removed after drainage was reduced to less than 30 ml in 24 hours following which the patients were discharged. The patients were examined by a standard physical examination after one week, after one month and every three months thereafter.

Statistical analysis

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) for Windows 10.0 software. Differences between the two groups were analyzed with $\chi 2$ test and student *t*-test. $\chi 2$ test was performed for the gender,clinical data, amount of analgesic requirement, complication rates and ASA scores. Student's *t*-test was performed for the age, hospital stay, operating time, weight of specimen and VAS score. Results were evaluated within a 95% confidentiality range and a *P* value of less than 0.05 was considered significant.

Results

The drained group consisted of 2 men and 48 women with a mean age of 47.76±11.22 years. The non-drained (plus fibrin sealant) group comprised of 10 men and 40 women with a mean age of 44.72±11.32 years. There were no significant differences regarding ASA scores between these groups of patients (Table 4). The indications for surgery are presented in Table 1 and clinical data are presented in Table 5. Twenty-five patients (50%) in the non-drained group did not need intramuscular analgesic, whereas 15 patients (30%) did not in the drained group (P=0.01). In addition, the mean amount of intramuscular analgesic requirement was significantly less in the non-drained group than in the drained group (P=0.02). These data are presented in Table 2.

Twenty five patients (50%) patients were discharged before 24 h, 22 patients were discharged between 24 and 48 h, and 3 patients were discharged after 48 h in the non-drained group. In the drained group, only one patient was discharged before 24 h, whereas 31 patients were discharged between 24 and 48 h, and 18 patients after 48 h. The mean hospital stay was significantly shorter in the non-drained group when compared to the drained group.

The complication rates were similar between the two groups. No patient needed surgical revision or re-operation for any complication and all complications were successfully managed with conservative care (Table 3). None of the patients had respiratory distress. Three patients had tingling sensation and five patients developed

Table 1: Demographics, diagnoses

Demographics	(Group 1; n=50)	(Group 2; n=50)	*P* value
Age	47.76±11.22	44.72±11.32	0.600
Sex M/F	2/48	10/40	0.480
Diagnoses			0.600
MNG	35	37	
Toxic MNG	11	8	
Graves' disease	4	5	

MNG: Multinodular goiters
P < 0.05 was considered significant

Table 2: The operative and postoperative values of the patients

	Operating time (min)	VAS score		Amount of intramuscular analgesic	Hospital stay (days)
		POD 0	POD 1		
Drained (Group 1)	129.10±31.59	5.20±1.22	4.38±1.12	1.54±1.32	2.8 ± 1.2
Non-drained (Group 2)	135.10±31.14	2.58±1.04	1.87±0.66	0.99±1.00	1.5 ± 0.8
P value	0.27	0.03	0.03	0.02	0.001

MNG: Multinodular goiters
P < 0.05 was considered significant

Table 3: Complications

Complications	Drained (Group 1)	Non-drained (Group 2)	*P* value
Haematoma	1(2%)	1(2%)	P=0.69
Seroma	2(4%)	2(4%)	
Wound infection	2(4%)	0(0.0%)	
Transient hypoparathyroidism	2(4%)	2(4%)	

P value was presented for the total number of complications

Table 4: Severity scores

	Drained (Group 1; n=50)	Non-drained (Group 2; n=50)	*P* value
ASA Score			P=0.107
I	1(2%)	2(4%)	
II	20(40%)	18(36%)	
III	21(42%)	20(40%)	
IV	8(16%)	10(20%)	
V	0	0	

transient tetany. Two patients developed transient change in voice with one of them belonging to the drain group, but with the difference being non significant (p= 0.36).

Discussion

Drains have been traditionally used in most of the surgical procedures with limited evidence to suggest any benefit[10,11]. It has been common practice to drain wounds routinely after thyroid and parathyroid surgery. However, the frequency of serious postoperative haematoma is very low in neck surgery performed by experienced surgeons and does not seem to increase in the absence of drains[12,13]. Traditionally, the main expectation for drain usage is to prevent postoperative complications by evacuating post-operative haematoma or lymphatic fluid and to alert the surgeon to early postoperative bleeding[14]. Haemorrhage may be life-threatening. Thus, surgeons generally place drains after thyroid operations to prevent haemorrhage and to detect bleeding early[1]. On the other hand, drain placement predisposes the area to infection and prolongs hospital stay[6,7,15,16,17]. It is established that the risk of respiratory failure caused by haematoma is greatest during the first 6h after thyroid surgery, so patients are usually discharged on the day of operation[6,13,18,26]. Drains might be associated with possible infection[16,19,20]. The drains by virtue of the inflammation induced due to their presence may actually increase the drainage. The vaccum created

Table 5: Clinical data

	Drained (Group 1; n=50)	Non-drained (Group 2; n=50)	*P* value
Normal	34(68%)	32(64%)	***P*=0.69**
Co-morbidity			
Diabetes	8(16%)	10(20%)	***P* = 0.788**
COPD	7(14%)	7(14%)	
Psiquiatric	1(2%)	1(2%)	

COPD: chronic pulmonary obstructive disease;
Normal: Patients have no co-morbidity.

by the negative pressure of the drain may prevent the lymphatics from sealing off and thus cause increase in the seroma formation and drainage[19,21,26]. Schoretsanitis et al. [17] noted that an approximately 50% reduction in the VAS score occurs in the non-drained group. Similarly, in this study, postoperative pain dramatically decreased in most of the non-drained patients, especially in POD 1. These results showed that drain placement might be directly associated with increasing postoperative discomfort of the patient by increasing postoperative pain.

Previous studies showed that the greatest risk of respiratory failure caused by haematoma occurs during the first 6 h after thyroid surgery and this result disencourages the discharging of the patients on the day of the operation[6,18,19]. The hospital stay is a principal variable for cost analysis, and many studies have shown the relationship between hospital stay and the application of drains[6,17,22,23,24]. Drains have not shown the ability to decrease postoperative complications, but they may increase pain and hospital stay by 1.12–1.49 days[32,33,34]. A meta-analysis comparing 11 randomized controlled trials found that the only difference between drainage and no drainage is length of hospital stay[34,40].

Our study also showed clearly that the insertion of drains prolongs the hospital stay (2.6 ± 1.0 days in group 1 and 1.3 ± 0.7 days in group 2; $P = 0.001$).

The ultrasonic technology has become an important aspect of minimally invasive thyroid surgery[37]. It allows access to narrow operating fields, decreases pain, decreases operating room time, and provides good hemostasis[38,39]. We agree that the rate of postoperative bleeding and haematoma formation appears low with this technology, but we want to learn effects of fibrin glue in the thyroid surgery.

Fibrin glue is a biological adhesive material that is made of human fibrinogen and its multiple components. Fibrin glue promotes wound healing by enhancing homeostasis and angiogenesis, and by stimulating macrophages, which have a role in fibroblast proliferation and collagen production in the wound site[27].

Fibrin sealant has also been shown to be effective in reducing seroma formation in animal mastectomy models and in reducing drainage after axillary dissection[28,29]. Zucchelli and Silvestri[30] showed that this concentration of fibrin sealant shortened the hospitalization time after prostatectomy. Fibrin glues have been used extensively in head and neck procedures. Fibrin glues have been successfully used to reduce wound drainage and to improve other short-term postoperative results. It has been shown that fibrin glues can decrease the drain output in postthyroidectomy patients[31]. This may correlate with decreased postoperative bleeding in outpatient surgery.

Fibrin sealants offer a comparative advantage over under-flap suction in both thyroid and parathyroid surgery. Also, fibrin glue is less expensive, and its use prevents the discomfort felt by patients when a drain is removed[35]. Patel et al. [35]found that the use of fibrin glue resulted in a statistically significant decrease in the length of hospital stay following both types of surgery (124 patients who had undergone thyroidectomy and 47 patients who had undergone parathyroidectomy.) ($p = 0.033$ and $p = 0.022$, respectively).

A case of recurrent suppurative thyroiditis caused by pyriform sinus fistula was completely obliterated by injection of fibrin glue[36].

Conclusion

The present prospective randomized study verifies that routine drain placement after thyroid surgery for benign diseases is not necessary. In conclusion, hospitalization time and pain were less in the fibrin sealant group than in the control group.

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