### **Original Research Article**

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# Scar formation and patient satisfaction after thyroidectomy with and without surgical drains

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#### **ABSTRACT**

**Background:** Several comparative studies have documented the outcomes of negative pressure drain use after thyroidectomy. However, these previous studies did not focus on scar formation. The aim of this study was to compare thyroidectomy outcomes with and without negative pressure drain use in terms of scar formation.

**Methods:** Nine hundred seventy-five patients who underwent thyroidectomy between January 2012 and December 2013, at Kosin University Gospel Hospital were enrolled in this study. Patients were assigned to one of two groups at the surgeon's discretion: the negative pressure drain group (n=515) or the no drain group (n=460). Medical records were reviewed, and the incidence and severity of scar formation were compared. We estimated patient satisfaction seven months postoperatively based on aesthetic and functional outcomes using the patient and observer scar assessment scale.

**Results:** The incidence of mild scarring was higher in the no drain group, but this difference was not statistically significant (p=0.069). The incidence of severe scarring was significantly higher in the negative pressure drain group (5.83%, p<0.001). Based on the patient and observer scar assessment scale data from 205 patients, patient satisfaction was significantly higher in the no drain group (p=0.006). Itching was reported significantly less frequently in the no drain group (p=0.034). There were no significant differences between groups with respect to pain or observer scar scale score.

**Conclusions:** This study suggests that not using a drain after thyroidectomy leads to high patient satisfaction and reduces the likelihood of severe scar formation.

Keywords: Thyroidectomy, Drain, Scar, Patient satisfaction

#### **INTRODUCTION**

The routine use of negative pressure drains in thyroidectomy has been controversial and is dependent upon the institution and surgeon's experience. After thyroidectomy, postoperative bleeding occurs in only 0.3-1% of patients. However, the delayed discovery of a rapidly expanding hematoma can compress the airway and induce asphyxiation. The possibility of seroma formation during the postoperative period is high, especially in large dead spaces. The rationale for using drains is to prevent these complications. The opposing

argument suggests that drain use is not justified, as drains cannot substitute for meticulous surgical technique and sufficient hemostasis.<sup>4-6</sup>

The development of surgical instruments has reduced drain use after thyroidectomy. In addition, drains have been recognized as potential sites for postoperative infections. The several comparative studies have documented the outcomes after thyroidectomies with and without the use of negative pressure drains. However, no previous study has investigated scar formation at the surgical site. The aim of this study was to compare scar

formation after thyroidectomies performed with and without negative pressure drains.

#### **METHODS**

A retrospective review was performed on 1071 patients who underwent total thyroidectomy, from January 2012 to December 2013. Patients who had total thyroidectomy with radical neck dissection (n=96) were excluded. Drain use was determined at the discretion of the thyroid surgeon (J. H. Park). Transverse cervical incisions for total thyroidectomy were closed by a plastic surgeon. The patients were divided into two groups depending on drain usage: negative pressure drain group (drain group) and non-drain group (no-drain group). When the total amount of drainage was less than 15ml over 24 hours, the drains were removed.

During the medical chart review we compared the incidences of mild and severe scarring. Scars were classified into three categories: hypertrophic, widened, and retracted (Figure 1). In observational cases, if any scar was present but not treated, it was defined as a mild scarring. If any treatments (e.g., scar revision, steroid injection) were performed on the scar, it was defined as severe scarring.

Two plastic surgeons performed scar evaluations using the Patient and Observer Scar Assessment Scale (POSAS) at seven months postoperatively (Figure 2). At this point, the patients' POSAS satisfaction scores, which included pain and itching sensations, were evaluated via a survey (Figure 3).

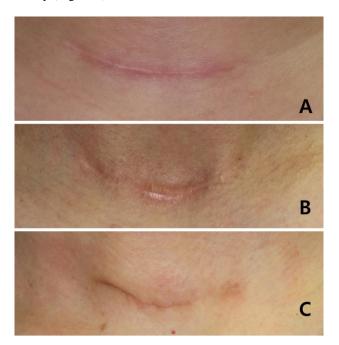


Figure 1: Three types of scars formed after transverse cervical incision for thyroidectomy. Typical examples of hypertrophic scar (A), widened scar (B), and retracted scar (C).

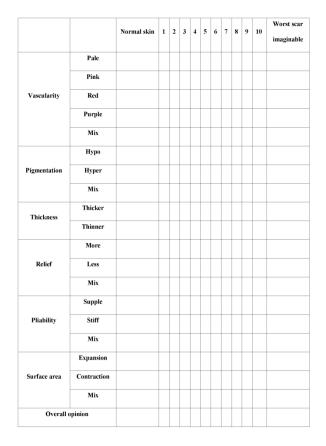


Figure 2: Linear surgical scars were assessed for vascularity, pigmentation, thickness, relief, pliability, and surface area.

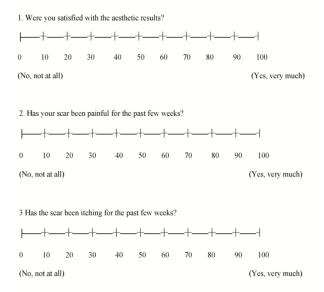


Figure 3: Patient satisfaction levels and functional results at seven months post-operation.

#### Surgical and post-operative management

The thyroidectomies were performed by thyroid surgeons and per the usual protocol. After completion of irrigation and hemostasis, debridement and closure were performed by a plastic surgeon. In the drain group, drain tubes were placed under and above the platysma muscle. The platysmal muscular layer was repaired with 4-0 Monosyn® sutures (B. Braun, Germany), and the subcutaneous layer was repaired with buried 5-0 and 6-0 Monosyn® sutures (B. Braun, Germany). The skin was closed with 7-0 black silk® (Ethicon, Johnson & Johnson, New Brunswick, NJ, US) simple interrupted sutures. A mild compressive dressing with antibiotic ointment was applied. On postoperative day four, all stitches were removed, Histoacryl® (N-butyl-2cyanoacrylate, B. Braun, Germany) was applied, and an occlusive dressing was placed (Tegaderm<sup>TM</sup>, 3M Health Care, St. Paul, MN, US). The drain tubes were removed when the amount of drainage was less than 30ml/24hr. The histoacryl was removed at the clinic, and steri-strips were placed one week later. An ointment gel was applied to the operation site scar for 6 months.

#### Statistical analysis

Statistical analysis was conducted using SPSS ver. 20.0 (SPSS Inc., Chicago, IL, USA). The results of the POSAS test were expressed as means and standard deviations. Student's t test was used for statistical analysis. Results were evaluated within a 95% confidence interval and a p value less than 0.05 was considered significant.

#### **RESULTS**

Aesthetic closure was completed by placing negative pressure drains in 515 patients (drain group), and the remaining 460 patients were closed without drains (nodrain group). The mean ages and male to female ratios were statistically similar in the two groups. On average, the tubes were removed after 4.52 postoperative days. Follow-up ranged from 9 to 25 months after surgery, with a mean of 18.3 months.

Mild scarring was observed in 41 (7.96%) cases (14 hypertrophic, 2 widened, and 27 retracted scars) in the drain group and in 54 (11.74%) cases (7 hypertrophic, 6

widened, and 41 retracted scars) in the no-drain group. Statistical significant differences in mild scarring were not found between the two groups (p=0.069) (Table 1).

The incidence of severe scarring was significantly higher in the drain group than in the no-drain group (30, 5.83% vs 8, 1.73% cases; P<0.001). Hypertrophic, widened, and retracted scars were found in 27, 2, and 1 cases in the drain group and 6, 2, and 0 cases in the no-drain group, respectively (Table 2).

In the drain group, the satisfaction level was  $58.92\pm23.99$ , the pain score was  $16.96\pm21.90$ , the itching score was  $15.26\pm21.70$ , and the observer scar scale was  $17.08\pm3.54$ . In the no-drain group, the satisfaction level was  $67.41\pm19.74$ , the pain score was  $16.44\pm20.61$ , the itching score was  $9.35\pm17.79$ , and the observer scar scale was  $16.28\pm3.52$ . Satisfaction was significantly higher and the itching sensation was significantly lower in the no-drain group (p=0.006 and p=0.034, respectively). There was no statistically significant difference in pain sensation or observer scar scale score (Table 3).

Table 1: Incidence of mild scarring.

Scar type	Drain group n=515	No drain group n=460
Hypertrophic	14	7
Widened	2	6
Retracted	27	41
Total (%)	41 (7.96)*	54 (11.74)

<sup>\*</sup>Not statistically significant at p=0.069.

Table 2: Incidence of severe scarring.

Scar type	Drain group n=515	No drain group n=460
Hypertrophic	27	6
Widened	2	2
Retracted	1	0
Total (%)	30 (5.83)*	8 (1.73)

<sup>\*</sup>Statistically significant at p<0.001.

Table 3: Analysis of post-operative patient satisfaction, pain, itching, and the observer scar scale.

Measure	Range	Drain group (mean±SD) n=97	No drain group (mean±SD) n=108	P value*
Satisfaction	0-100	58.92±23.99	67.41±19.74	$0.006^{\dagger}$
Pain	0-80	16.96±21.90	16.44±20.61	0.86
Itching	0-80	15.26±21.70	9.35±17.79	$0.034^{\dagger}$
Observer scar scale	10-32	17.08±3.54	16.28±3.52	0.105

SD, standard deviation; \*Student's t test; †Statistically significant at p<0.05.

#### **DISCUSSION**

Transverse cervical incision is the most popular technique in conventional open thyroidectomy. The conventional incision used for thyroidectomy yields a very exposed surgical site, even when dressed, and can

result in cosmetically unfavourable outcomes. Visible scars remain a problem for surgeons after thyroidectomy. Several studies have been conducted in an effort to address the issue of visible scars left by endoscopic techniques. <sup>16-19</sup> Endoscopic thyroid surgery produces an excellent cosmetic result with access to hidden sites.

However, endoscopic thyroidectomies require a longer operation time than conventional ones. The endoscopic approach is also challenging for a novice surgeon and involves a long learning curve.<sup>20</sup> Therefore, the conventional open procedure is still widely utilized. Until recently, it was common practice to drain the operative site during a conventional open procedure. Drains were usually placed after thyroid surgery to prevent hematoma and seroma formation in the thyroid bed. Several benefits to placing a negative pressure drain after thyroidectomy have been reported, including a reduction facilitation postoperative dead space, of repositioning, and a faster recovery. 14,21,22 However, debate continues regarding the best scenarios for drain usage after thyroidectomy. In 2006, Lee et al reported that the non-drain method is safe and effective, even in thyroidectomy combined with central neck dissection.<sup>11</sup> In a meta-analysis of complications of wound drains after thyroid surgery. Woods et al reported that use of drains does not decrease the risk of reoperation for neck hematoma or other complication, but it does increase wound infection rates and may increase the length of hospital stay and postoperative pain.<sup>23</sup> Similarly, Tian et al found comparable results in postoperative infection rate and hospitalization period. <sup>12</sup> In addition, the study showed no statistically significant differences between the groups for hematoma, hemorrhage, hypothyroidism, recurrent laryngeal nerve palsy, or seroma.

Overall, these studies were analogous in the occurrence rates for various complications. However, previous studies of drain versus non-drain thyroidectomies did not address postoperative scar formation.

Authors have comparatively analysed thyroidectomy scar formation using the POSAS, which is a reliable and feasible evaluation method for linear scars. 24,25 In this scale, all items are represented on a numerical scale ranging from 1 to 10. The wideness of the scale allows for a greater subjective description of the individual scar. The observer portion of the patient and observer scar assessment scale contains parameters (vascularization, pigmentation, thickness, relief, and pliability) that were selected after a critical review of scar evaluation tools and clinical experience.<sup>26</sup> Patients may have more diverse problems than observers recognize, and their own perspectives can influence their quality of life.<sup>27</sup> Functional factors, such as itching sensation and pain, are not usually evaluated by observers, but they were included in this study using a patient scale along with the effects of functional factors per satisfaction level.<sup>25</sup> In the patient and observer scar assessment scales, patient satisfaction in the drain group was lower than in the no drain group. It seems possible that these results are due to the inconvenience of having a drain tube and additional scar formation by the trocar of the drain tube. There was a statistically significant difference in the scores for itching sensation; it was overall higher in the drain group. The reason for this is not clear, but it may have been related to hypertrophic scar formation. The complication

rate for hypertrophic scar formation in the drain group was higher in compared to the no drain group. Hypertrophic scars are often painful and pruritic due to a process that may be mediated by higher levels of the neuropeptide substance P.<sup>28</sup>

The incidence of severe scarring was statistically higher in the drain group. Regarding the scar type, there was an exceptionally large proportion of hypertrophic scars. Hypertrophic scars usually form secondary to excessive tensile forces across the wound.<sup>29</sup> There are three possible mechanisms for this result. The first is related to wound infections. A meta-analysis revealed that patients with drains were more likely to have postoperative infections compared to those without drains. 12 Wound infections can lead to wound dehiscence and poor scarring, i.e., hypertrophic scars. Increased pro-inflammatory cytokines may trigger abnormal fibroblast responses.<sup>30</sup> Wound healing can be affected by a minor infection as well as significant infection, the latter via a foreign body reaction. In most patients, the drain tube does not produce a foreign body reaction; however, it may act as a foreign body depending on the characteristics of each patient. Tensile forces also play a significant role. Hypertrophic scars usually form secondary to excessive tensile force across the wound. Continuous negative pressure drains can induce excessive tensile forces to the wound in the early phase of wound healing.

Although the current study has successfully demonstrated the linkage between drains and scars, it has some limitations. Other complications, like hematoma and seroma, can affect poor scar formation. Further multivariate analysis of how each complication relates to drain use and scar formation is needed. Operation time and tumor size can affect scar formation. Duration of thyroid surgery is a risk factor for surgical site infection. A larger tumor leaves a larger dead space after removal, which can affect wound healing. Further research should more closely examine the linkage between scar formation and each factor. While there are limitations, this is the first comparative study focused on scar formation after drain and non-drain thyroid surgery.

Drain insertion has been regarded as a basic procedure to prevent airway compromise caused by acute hematoma or huge seroma formation during thyroid surgery. With the development of surgical instruments and techniques, meticulous hemostasis during thyroid surgery can be performed effectively and can reduce the incidence of such complications. This study suggests that thyroidectomy performed without drain insertion leads to higher patient satisfaction and reduces the likelihood of severe scar formation.

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Institutional Ethics Committee

#### REFERENCES

- 1. Defechereux T, Hamoir E, Nguyen Dang D, Meurisse M. Drainage in thyroid surgery. Is it always a must? Ann Chir. 1997;51:647–52.
- 2. Colak T, Akca T, Turkmenoglu, Canbaz H, Ustunsoy B, Kanik A, et al. Drainage after total thyroidectomy or lobectomy for benign thyroidal disorders. J Zhejiang Univ Sci B. 2008;9:319-23.
- 3. Bergqvist D, Kallero S. Reoperation for postoperative haemorrhagic complication. Analysis of a 10-year series. Acta Chirurgica Scandinavica. 1985;151:17-22.
- 4. Karayacin K, Besı'm H, Ercan F, Hamamci O, Korkmaz A. Thyroidectomy with and without drains. East Afr Med J. 1997;74:431–2.
- 5. Ruark DS, Abdel-misih RZ. Thyroid and parathyroid surgery without drains. Head Neck 1992;14:285–7.
- 6. Peix JL, Teboul F, Feldman H, Massard JL. Drainage after thyroidectomy: a randomized clinical trial. Int Surg. 1992;77:122–4.
- Ariyanayagam DC, Naraynsingh V, Busby D, Sieunarine K, Raju G, Jankey N. Thyroid surgery without drainage: 15 years of clinical experience. J R Coll Surg Edinb. 1993;38:69–70.
- Teboul F, Piex JL, Guibaud L, Massard JL, Ecochard R. Prophylactic drainage after thyroidectomy: a randomized trial. Ann Chir. 1992;46:902–4.
- 9. Kristoffersson A, Sandzen B, Jarhult J. Drainage in uncomplicated thyroid and parathyroid surgery. Br J Surg. 1986;73:121–2.
- Schwarz W, Willy C, Ndjee C. Gravity or suction drainage in thyroid surgery? Control of efficacy with ultrasound determination of residual hematoma. Langenbecks Arch Chir. 1996;381:337– 42.
- 11. Lee SW, Choi EC, 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;116:1632-5.
- 12. Tian J, Li L, Liu P, Wang X. Comparison of drain versus no-drain thyroidectomy: a meta-analysis. Eur Arch Otorhinolaryngol. 2017;274(1):567-77.
- 13. Corsten M, Johnson S, Alherabi A. Is suction drainage an effective means of preventing hematoma in thyroid surgery? A meta-analysis. J Otolaryngol. 2005;34:415-7.
- Suslu N, Vural S, Oncel M, Demirca B, Gezen FC, Tuzun B, et al. Is the insertion of drains after uncomplicated thyroid surgery always necessary? Surg Today. 2006;36:215-8.
- 15. Woo SH, Kim JP, Park JJ, Shim HS, Lee SH, Lee HJ, et al. Comparison of natural drainage group and negative drainage groups after total thyroidectomy: prospective randomized controlled study. Yonsei Med J. 2013;54:204-8.

- 16. Ji YB, Song CM, Bang HS, Lee SH, Park YS, Tae K. Long-term cosmetic outcomes after robotic/endoscopic thyroidectomy by a gasless unilateral axillo-breast or axillary approach. J Laparoendosc Adv Surg Tech A. 2014;24:248–53.
- 17. Jeong JJ, Kang SW, Yun JS, Sung TY, Lee SC, Lee YS, et al. Comparative study of endoscopic thyroidectomy versus conventional open thyroidectomy in papillary thyroid microcarcinoma patients. J Surg Oncol. 2009;100:477–80.
- 18. Miccoli P, Berti P, Raffaelli M, Materazzi G, Baldacci S, Rossi G. Comparison between minimally invasive video-assisted thyroidectomy and conventional thyroidectomy: a prospective randomized study. Surgery. 2001:130:1039–43.
- 19. Liu J, Song T, Xu M. Minimally invasive videoassisted versus conventional open thyroidectomy: a systematic review of available data. Surg Today. 2012;42:848–56.
- 20. Liu S, Qiu M, Jiang DZ, Zheng XM, Zhang W, Shen HL, et al. The learning curve for endoscopic thyroidectomy: a single surgeon's experience. Surg Endosc Other Interv Tech. 2009;23:1802–6.
- 21. Shaha AR, Jaffe BM. Selective use of drains in thyroid surgery. J Surg Oncol. 1993;52:241–3.
- 22. Wax MK, Valiulis AP, Hurst MK. Drains in thyroid and parathyroid surgery. Are they necessary? Arch Otolaryngol Head Neck Surg. 1995;121:981–3.
- 23. Woods RSR, Woods JFC, Duignan ES, Timon C. Systematic review and meta-analysis of wound drains after thyroid surgery. Br J Surg. 2014;101;446-56.
- 24. van de Kar AL, Corion LU, Smeulders MJ, Draaijers LJ, van der Horst CM, van Zuijlen PP. Reliable and feasible evaluation of linear scars by the Patient and Observer Scar Assessment Scale. Plast Reconstr Surg. 2005;116:514-22.
- 25. Kim HY, Kim JW, Park JH, Kim JH, Han YS. Personal Factors that Affect the Satisfaction of Female Patients Undergoing Esthetic Suture after Typical Thyroidectomy. Arch Plast Surg. 2013;40:414-24.
- van Zuijlen PP, Angeles AP, Kreis RW, Bos KE, Middelkoop E. Scar assessment tools: Implications for current research. Plast Reconstr Surg. 2002;109:1108-22.
- 27. Powers PS, Sarkar S, Goldgof DB, Cruse CW, Tsap LV. Scar assessment: current problems and future solutions. J Burn Care Rehabil. 1999;20:54-60.
- 28. Scott JR, Muangman P, Gibran NS. Making sense of hypertrophic scar: a role for nerves. Wound Repair Regen 2007;15:S27–S31.
- 29. Lorenz P, Sina BA. Scar prevention, treatment, and revision. Chapter 16. In: Neligan PC (ed), Plastic surgery. 3rd edition. Elservier; 2013: 297-318.
- 30. Sandulache VC, Parekh A, Li-Korotky H, et al. Prostaglandin E2 inhibition of keloid fibroblast migration, contraction, and transforming growth factor (TGF)-beta1-induced collagen synthesis. Wound Repair Regen. 2007;15:122–33.

- 31. Elfenbein DM, Schneider DF, Chen H, Sippel RS. Surgical site infection after thyroidectomy: a rare but significant complication. J Surg Res. 2014;190:170-6.
- 32. Bures C, Klatte T, Gilhofer M, Behnke M, Breier AC, Neuhold N, et al. A prospective study on surgical-site infections in thyroid operation. Surgery. 2014;155:675-81.

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