



## Predisposing factors for seroma formation in patients undergoing thyroidectomy: Cross-sectional study



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### ABSTRACT

**Introduction:** Seroma is defined as collection of fluid within the surgical site during postoperative period that causes several complications. Recognition of predisposing risk factors can lead to avoid seroma formation after thyroidectomy.

**Materials and methods:** A cross-sectional study was carried out during a 3-year period and 678 patients were enrolled the study. We recorded demographic data, past medical history and the type of thyroidectomy were for all patients. We measured total and ionized serum calcium and albumin level in all patients before surgery and a day after it. All patients underwent total or subtotal thyroidectomy and if needed central neck dissection was performed subsequently. Patients underwent serial aspiration if they had seroma formation.

**Results:** The overall post-thyroidectomy seroma incidence was 2.2%. There was no statistically significant correlation while evaluating gender, age and body mass index with post-operative seroma formation. However, seroma formation was significantly higher in patients underwent total thyroidectomy ( $P = 0.041$ ). The results of postoperative laboratory tests showed a significant lower level of ionized calcium in patients with seroma formation ( $P < 0.0001$ ). Logistic regression showed statistically significant value for variables including age, BMI and decreased ionized calcium level, in developing of seroma. **Conclusion:** We showed that Seroma formation was lower during thyroidectomy via electrical vessel sealing system in comparison with previous studies. In our study, older age, greater body mass index and decreased ionized calcium level were predictors of seroma formation.

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## 1. Introduction

Recent development in thyroid neoplasms diagnosis has led to increase in number of thyroidectomies [1,2]. Although, it has been a minimally invasive and safe procedure since the late nineteenth century, some serious complications associated with parathyroid and thyroid surgeries result in patients dissatisfaction and prolonged hospitalization [3,4]. According to previous studies, main complications of thyroid surgeries includes recurrent laryngeal nerve injury, hypocalcemia, surgery site infection, hematoma and

seroma formation [5,6].

Seroma is defined as collection of fluid within the surgical site during postoperative period. Seroma formation is one of the common complications of surgeries such as, breast, laparoscopic inguinal hernia repair, and axillary lymphadenectomy [7,8]. The reported incidence for seroma subsequent to conventional thyroid surgery varies from 1.3% to 7%. Cosmetic problems, regional swelling, flap necrosis, and risk of surgical site infection are the most common complications, due to seroma formation among thyroidectomy patients, that lead to prolonged hospital stay and higher admission costs [9,10].

The overall etiology and pathophysiology of the seroma is not completely understood [11]. To prevent development of seroma, some surgeons benefit neck drainage after thyroidectomy. However, its overall efficacy is still unknown, considering studies that

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suggested the drains to be used only in critical cases or when the dead space is very large, [4,12].

Considering several complications of the seroma and lack of the appropriate prevention for this undesirable issue, recognizing risk factors may lead to avoid it in thyroidectomy patients. In addition, it has been hypothesized that serum calcium level may play a role in seroma formation through affecting coagulation process [11]. In current study, we aimed to study the predisposing factors on post-operative seroma incidence in patients underwent thyroidectomy by electrical sealing tools.

## 2. Materials and methods

### 2.1. Study population

In order to evaluate predictive factors of seroma formation in patients undergo thyroidectomy, an observational cross-sectional study was carried out in thoracic surgery wards of Imam Reza and Taleghani hospitals, Tabriz, Iran. The study protocol was approved by ethics committee of Tabriz University of Medical Sciences, and our report designed in line with the PROCESS criteria [13]. We studied 738 consecutive patients between March 2013 to March 2016, who underwent thyroid surgery including total thyroidectomy (with or without neck dissection), near total thyroidectomy, subtotal thyroidectomy.

Patients with history of coagulopathies or anti-coagulant drugs consumption (who had impaired results of prothrombin time (PT), partial thromboplastin time (PTT) and international normalized ratio (INR) test), hypocalcaemia (total calcium < 8.5 mg/dL or ionized calcium < 1.9 mmol/dL) and calcium supplement consumption, were excluded. In addition, patients who suffered complications such as surgical site infection, recurrent laryngeal nerve palsy and hematoma, did not enroll in the study. Of 738 patients, 60 patients excluded and 678 patients enrolled the study. All patients provided written informed consent to participate in the study. Demographic data including age, sex, body mass index (BMI) were collected prospectively from hospital records for all patients during admission, as well as clinical characteristics such as past diseases history, drug history, thyroid examination, surgical procedure and perioperative course. We measured serum total and ionized calcium level and albumin level in all patients one day prior to the surgery and first postoperative day. Demographic features (including age, sex), body weight, body height, history of hypertension, thyroidectomy type, serum calcium level and serum albumin level were evaluated for further correlation with seroma formation.

### 2.2. Procedure

All patients underwent surgery and operations were performed by an experienced surgeon (S.Z.R.H, general and thoracic surgeon) with more than 10 years' of experience in thyroid surgery, using LigaSure™ Small Jaw (LSJ) Instrument. Thyroid surgery was performed using a 3–4 cm collar incision immediately 1 cm below cricothyroid cartilage. Platysma muscle was cut and subsequently superior and inferior subplatysmal flaps were raised up to the superior border of thyroid cartilage and sternal notch, respectively. In order to provide enough exposure of thyroid gland, especially in large goiters, strap muscles were divided by monopolar cutter in midline. Then, superior thyroid pedicle was individually divided and ligated. Subsequently, recurrent laryngeal nerve (RLN) were identified as well as parathyroid glands in each side and preserved if possible. Subsequently, inferior thyroid pedicle was ligated using LSJ. Inadvertently removed parathyroid glands or glands with disrupted blood flow were immediately auto transplanted in

ipsilateral sternocleidomastoid (SCM) muscle. Hemovac drain implantation was up to surgeon's decision and placed into the thyroid bed deep to the strap muscles to provide neck drainage and fixation was performed by 0–1 silk sutures. Patients' drains were removed if drainage was < 50 cc in a 48-hour period.

Post-operative physical examination was performed by the surgeon, at the end of the first and third weeks, as well as the end of the second month postoperative. In case of clinical suspicion for fluid accumulation in surgical site, patients underwent neck ultrasonographic study. Subsequently, percutaneous aspiration was done using a 5 cc syringe with 21-gauge pinhead, and aspirated fluid amount measured and recorded. All patients with seroma underwent serial aspiration until resolution.

### 2.3. Statistical analysis

All data were analyzed using SPSS version 22. Software (SPSS Inc., Chicago, IL). In order to express quantitative values, we used mean  $\pm$  SD. Variables analysis performed using student t-test and X [2] test for paired data analysis and results with  $p < 0.05$  were considered as statistically significant. A linear regression was run to determine the effect of age, gender, smoking, hypertension, surgery type, drain implementation and serum calcium on post operative seroma formation.

### 2.4. Ethics

To participate in study, all patients asked to provide their informed consent. This study was approved by the Institutional Review Board (IRB) of the Research Chancellor of the Tabriz University of Medical Sciences, Tabriz, Iran.

## 3. Results

In current study, 678 patients undergone subtotal and total thyroidectomy, enrolled. Of 678 patients, 560 (82.5%) were female and 118 (17.5%) were male with mean age of  $43.39 \pm 3.52$ . One hundred-and-four patients (15.3%) had positive history for hypertension disease and had received anti-hypertensive drugs. Patients' demographic data including body height and weight, body mass index (BMI) and surgical procedures are summarized in Table 1. Drain implemented in 183 patients (26.9%), who were suspicious to develop hematoma, considering thyroid bed-side after resection. Of 183 patients, 147 patients (80.3%) had undergone total thyroidectomy with subsequent neck dissection and 36 patients (19.7%) underwent total thyroidectomy without neck dissection.

Post-thyroidectomy seroma developed in 15 patients (2.2%). Of these, seroma formation detected in 10 (66.7%) patients during first post-operative week, and in 5 patients (33.3%) during second post-operative week. All patients were undergone total thyroidectomy, however, neck dissection was performed only in 8 patients (53.3%). Seroma location was above suprasternal notch in all patient, however, extended up to level of the superior thyroid notch of thyroid cartilage in 2 patients. The suffered area minimum and maximum calculated 6 cm [2] and 15 cm [2], respectively. Seroma aspiration performed as instructed in all suffering patients, and the frequency of aspiration was varying between 1 and 5 attempts. Seroma resolved in most of the patients in less than three aspiration attempts. Aspirated volume and number of attempts to recover patients seroma are listed in Table 2. During follow-up, none of the patients developed post-operative complications such as incision leak due to seroma, cosmetic problems and surgery site infections (SSI).

Comparing seroma incidence with regard to patients' gender, age and BMI correlation with post-operative seroma formation in

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