



## Surveillance of surgical site infections after thyroidectomy in a one-day surgery setting

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### ABSTRACT

**Background and aim:** Different studies underline the importance of hospital stay on the development of infectious complications. We performed an audit of surgical site infections (SSI) after thyroidectomy was performed in a one-day surgery setting.

**Materials and methods:** One hundred and twelve consecutive patients admitted between April 2007 and discharged before May 2008 were studied. Patient selection criteria for one-day surgery were specific medical and social-logistic status. The technique of thyroidectomy was standardized.

**Results:** SSI affect 2.6% of patients undergoing thyroid surgery with short hospitalization. The incidence of SSI was 3.2% following thyroidectomy, 2% for lobectomy. Mean time interval to symptom onset was 3 days (range 2–6). Most likely organism was *Staphylococcus aureus*. WI was associated with prolonged ambulatory medications.

**Conclusions:** Rates of SSI are similar to those described in the literature with longer hospitalization. All SSI become evident only after patient discharge. Prevention of SSI is very much the responsibility of the persons working in the operating theater. Effort should be made to improve sterile technique. Appropriate antibiotic coverage is indicated when infection develops postoperatively.

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## 1. Introduction

Surgical site infections (SSI) are a major source of postoperative illness, accounting for approximately a quarter of all nosocomial infections.<sup>1</sup> These infections number approximately 500,000 per year, among an estimated 27 million surgical procedures, and account for approximately one quarter of the estimated 2 million nosocomial infections in the United States each year.<sup>2,3</sup>

Although most large pertinent series note SSI after thyroidectomy, only few studies report the real incidence and have examined it in detail.<sup>3–10</sup>

We previously designed a study to identify specific risk factors for the development of wound infection (WI) after thyroidectomy, evaluating the underlying bacteriology, illustrating the clinical presentation, treatment and outcome.<sup>11</sup>

Aim of this study is to describe the incidence of WI, the impact on postoperative clinical outcome and pathway after thyroidectomy was performed in a short hospitalization (one-day thyroid surgery setting).

## 2. Materials and methods

Prospective analysis of 112 consecutive patients undergoing elective thyroidectomy from April 2007 to May 2008 in a one-day surgery setting (i.e. <23 h, one night recovery).

Patient selection criteria for one-day surgery were specific medical and social-logistic status.<sup>12</sup> Selected patients were based on criteria, including those of the American Society of Anesthesiologists (ASA).<sup>13</sup> Only patients of I–II ASA grades were treated. Complete preoperative assessment (thyroid hormone serum levels, ultrasonography to evaluate both nodule size and gland volume, fine needle aspiration cytology) was obtained from all patients.<sup>14</sup> Specific medical criteria were first neck surgery, euthyroidism, and ultrasound-estimated volume < 80 mL.<sup>12</sup> Patients with locally advanced thyroid tumors, intrathoracic goiter, previous thyroid surgery, ultrasound-estimated thyroid volumes > 80 mL, or patients undergoing lateral neck dissection were excluded from short stay thyroid surgery. Patients who were taking a drug that had an effect on coagulation were excluded. The social-logistic selection criteria were established autonomy at discharge, living at a distance of less than 100 km from hospital, had a telephone, suitable house and adequate home support at dimmission, able to understand, read, and speak local language, consenting to being discharged the day after surgery.<sup>12</sup>

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The occurrence (within 30 days from surgery) of WI was monitored in all patients with specific database. These infections were classified into superficial (skin and subcutaneous tissue) and deep (deep soft tissue–muscle and fascia).

Moreover, the patient was made to have shower the morning of operative procedure. Men shaved their beard the morning of operation. Surgeon or nurse washed incision site before performing antiseptic skin preparation with approved agent. Skin was prepared with antiseptic in concentric circles from incision site (3 times). Between consecutive operations we performed surgical scrub for 2–5 min. The technique of thyroidectomy was standardized and has been described.<sup>15</sup> Intraoperative neuromonitoring was used in all cases (NIM-Response 2.0 System, Medtronic Xomed). Haemostasis and dissection were achieved by means of vessel sealing system (Ligasure Precise, Covidien). Before closure, small silicone drain with a closed, passive evacuation system was always used. Strap muscles are reapproximated, as is the platysma, with interrupted absorbable sutures. The skin is closed by subcuticular suture, and Steri-Strips (3M™ Steri-Strip™ Adhesive Skin Closures) placed. No patient received antibiotics prophylaxis (AP). Mini-invasive thyroid procedure was not included in this study.

Outcome as morbidity and mortality rates was analysed.

### 3. Statistical analysis

All data for continuous variables were expressed as median and range. All patients' data were collected in a prospective manner with a dedicated electronic Microsoft Office Access Database (Microsoft Corp, Redmond, Washington, USA). The database is part of our department's quality-improvement program. In case of dichotomous variables, group differences were examined by  $\chi^2$  or Fisher exact tests as appropriate. Statistical analysis was computed with SPSS, release 15.0 for Windows (SPSS Inc, Chicago–Ill, USA). The level of significance was set at *P* less than 0.05.

### 4. Results

The study group included 67 women and 45 men with a mean age of 39.8 (age range 19–69 years). The mean thyroid volume estimated by preoperative ultrasonography was 39 (range 11–65) mL. Mean size of dominant nodules was 3.5 cm (range 1.2–5.5 cm). The treated pathologies were mainly nodular goiter and tumors (Table 1). Complete follow-up was available for all patients. Procedures performed were 62 (55%) total thyroidectomies and 50 (45%) emithyroidectomies.

No mortality was observed. Overall morbidity was as high as 17.8% (*N* = 20) and in most cases included transient complications (Table 2). No bilateral vocal cord paresis or paralysis occurred in the

**Table 1**  
Preoperative characteristics and operative parameters in 112 patients undergoing elective thyroidectomy in one-day surgery.

	<i>N</i>
Age (years)	39.8 (19–69)
Women	67
Men	45
Thyroid volume (mL) <sup>a</sup>	39 (11–65)
Dominant nodule diameter (cm)	3.5 (1.2–5.5)
Thyroid pathology	
-Non-toxic nodular goiter	68 (60)
-Follicular nodule	34 (30)
-Cancer <sup>b</sup>	10 (10)

Data are numbers or mean with percentages or ranges in parentheses.

<sup>a</sup> Estimated by preoperative ultrasonography (US).

<sup>b</sup> Papillary carcinoma (*N* = 9), follicular carcinoma (*N* = 1).

**Table 2**  
Morbidity.

	<i>N</i> (%)
Wound complication	6 (5.3)
-Hematoma	1
-Sieroma	2
-Infection	3
Permanent hypoparathyroidism	1 (0.9)
Permanent RLN injury	0
Temporary hypocalcaemia	10 (8.9)
Temporary RLN injury	3 (2.6)
Total	25 (16.4%)

study period. There was one case of permanent hypocalcaemia. No case of permanent RLN paralysis in the study group. The incidences of temporary hypoparathyroidism was 8.9% (10/112). One patient was readmitted with a diagnosis of symptomatic hypocalcaemia 2 days after discharge. The overall incidence of temporary RLN injury was 2.6% (3 patients).

We reported a wound morbidity of 1 hematoma (0.9%) and 2 seromas (1.7%), after the performance of 112 thyroidectomies. Three patients with postoperative WI were identified with an incidence of 2.6% (2 male, 1 female, mean age 44 years). The incidence of SSI was 3.2% (2/62) following total thyroidectomy, 2% following lobectomy only (1/50), thus even unilateral resections were not exempt from this complication (1 case). There was no difference in incidence per year or season of operation. SSI produced 1 or more symptoms: fever in 3, neck pain/pressure in 3, dysphagia in 1. No patient developed acute airway distress. In majority of cases the diagnosis was made by medical staff during ambulatory routine medications or in response to patient complaints. Ultrasonography (US) was used in all patients to evaluate the depth of WI. Mean time interval to symptom onset was 3 days (range 2–6 days). All patients developed WI within the 6 postoperative days after the initial procedure. In our experience, 2 cases (66%) between the 4th and the 5th day, and 1 (34%) on 6th postoperative day. Thus, no diagnosis was made during one-day hospital stay. No patient required a second cervical re-exploration for pus accumulation or for excessive drain output. All patients were treated conservatively with daily medications. Two cases were found to have superficial WI and 1 case had WI deep into the strap muscles. The bacteriology source was identified in all the patients: the most likely organism was *Staphylococcus aureus* (*N* = 3). The mean duration of support medications was 11.2 days (range 6–18 days) after discharge. SSI after thyroidectomy become evident only after patient discharge. One study patient required re-admission for WI evacuation (48 h recovery). WI was associated with prolonged ambulatory medications: WI group of patients 11 ± 3 mean medications versus 3 medication patients without SSI. Therefore successive hospital costs were effectively increased for patients with WI and subsequent medications. All patients recovered well after medications except one who developed cheloid.

### 5. Discussion

The hypothesis of this study was that the incidence of SSI after thyroidectomy performed with a short hospitalization was lower than the one reported in the literature with longer hospitalization. Different studies in literature underline the importance of hospital stay on the development of infectious complications.<sup>17–20</sup> Longer pre- and postoperative stays are associated with a higher incidence

of infections.<sup>17–20</sup> Authors suggest to keep preoperative stay in hospital as short as possible.<sup>17–20</sup> The incidence of postoperative WI was 2.6%: the rate is the same as for SII after thyroidectomy was performed in an ordinary recovery (>24 h).<sup>11</sup> Thus, the importance of a gentle, proper and meticulous technique of the surgical team as well as the general health and disease state of the patient must be emphasized. Effort should be made to improve sterile technique. Infection occurs as a result of a break in the sterile technique, and the most likely organisms are skin contaminants.<sup>11</sup>

SSI are frequently responsible for re-hospitalizations, re-interventions, prolonged length of hospitalization, blood tests and radiologic examinations, more ambulatory wound medications and visits, thus an increased hospital cost (including all those incurred in the original surgical admission and any re-admission). Thus, the developed WI did interfere with the postoperative clinical outcome and pathway. These data suggest potential interventions for the prevention of infections following thyroid surgery that could substantially improve patient outcomes and decrease medical care costs. Knowledge of the attributable costs of SSI in this patient population can be used to justify infection control interventions to reduce the risk of infection.

The threat of WI has implications on the current trend toward outpatient endocrine surgical procedures and its inherent risk should be strongly considered before establishing outpatient practice guidelines. No WI presented within 3 days of initial operation was reported in this study; 2/3 of WI were diagnosed and treated in the outpatient clinic or at the patient's home. One deep infection required re-admission.

The use of AP against SSI is widespread in thyroid surgery, while results from prospective randomised controlled trials in guiding antibiotic use are lacking.<sup>3–11</sup> The appropriateness of administration and indications for AP use must be evaluated in new studies. Thyroid surgery is considered a “clean” procedure, and AP is not indicated. The use of AP has not been shown to affect the incidence of WI in our previous study.<sup>11</sup>

Potential perioperative risk factors for WI after thyroidectomy have been evaluated in the literature.<sup>3–11</sup> The frequency of WI tended to be higher in patients undergoing reoperation.<sup>16</sup> WI rate increased in direct relationship with the extent of thyroid resection.<sup>6,8</sup> Patients with locally advanced thyroid tumors were excluded from short stay surgery.

Early recognition with immediate intervention is the key to the management of this complication in the post-thyroidectomy period. We recommend close wound observation and surveillance after thyroidectomy and early exploration and evacuation in all patients who develop postoperative WI. A conservative approach may be considered in patients with superficial WI and no progression. Appropriate antibiotic coverage is indicated when infection develops postoperatively, but the most important

element in the management of WI is to establish adequate drainage.

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