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Postoperative Outcomes of Post-Thyroidectomy Drains: Suction Drain Versus Rubber Drain - A Narrative Review

Osama H.Gharib, Moustafa Baiomy, Ahmed Samir Wajeh Ahmed, Ahmed M. Mahgoub
Department of General Surgery, Faculty of Medicine, Zagazig University, Egypt
***Corresponding author: Ahmed Samir Wajeh Ahmed**
E-mail: as888550@gmail.com

Abstract

Post-thyroidectomy drains facilitate the evacuation of blood and serous fluid from the surgical site, helping to prevent hematoma or seroma formation and promoting proper wound healing. Surgical drains can be classified by mechanism as passive or active. Passive drains act by capillary action, gravity, or fluctuation of intracavity pressure, whereas active drains are aided by low continuous, low intermittent, or high suction. Active drains permit reliable measurement of effluent, while rubber drains provide a simple passive route for drainage. Drains can assist in early detection of postoperative bleeding or chyle leak, but they may also act as a source of contamination, delay return of function, produce tissue reaction, or prolong healing time. This narrative review summarizes the surgical considerations, expected benefits, and complications of suction and rubber drains after thyroidectomy. Drain selection should be based on the nature of the drainage fluid, the need for accurate output measurement, the characteristics of the surgical wound, patient mobility, and careful postoperative monitoring. Every drain must be removed when it is no longer needed.

Keywords: Thyroidectomy; Suction Drain; Rubber Drain

Introduction

Total thyroidectomy is now the mainstay procedure for the management of patients with bilateral benign thyroid disorders. Many authors have reported that total thyroidectomy is performed safely and that low complication rates can be achieved with a meticulous surgical technique.

An expanding haematoma can cause life-threatening airway compression postoperatively. The surgical incision must be opened at the bedside and the haematoma evacuated. The airway must be secured immediately, and the patient returned to theatre for exploration and control of the bleeding site. In most cases, an obvious bleeding vessel is not visualized at the time of exploration.

Seromas occur in the early postoperative period and are more common with large goitres because of the greater dead space created following resection. Needle aspiration is usually sufficient treatment for this complication. Infection may also occur, and aseptic surgical technique and prophylactic antibiotics in high-risk cases may minimize infection (Randolph, 2020).

Post-thyroidectomy drains facilitate the evacuation of blood and serous fluid from the surgical site, helping to prevent hematoma or seroma formation and promoting proper wound healing. Drains can also assist in the early detection of postoperative bleeding or chyle leak, allowing timely intervention and reducing the risk of complications (Mujagic et al., 2019; Wang et al., 2017).

Surgical Anatomy Relevant to Drainage After Thyroidectomy

The normal thyroid gland is located in the anterior part of the neck and consists of two lateral lobes connected anteriorly by the isthmus. In adults, the average thyroid gland weighs 10 to 20 g. Superiorly, it extends to the level of the middle of the thyroid cartilage, and inferiorly it usually extends to the level of the sixth tracheal ring (Kapral and Khot, 2022).

The thyroid gland has two capsules. The inner true connective tissue capsule is thin and adheres closely to the gland. Extensions of this capsule within the substance of the gland form numerous septae, which divide it into lobes and lobules (Arrangoiz et al., 2018). The outer false or surgical capsule is formed by the middle layer of the pretracheal fascia. It is well developed anteriorly and laterally, while posteriorly it is thin and loose,

allowing enlargement of the thyroid gland posteriorly. The false capsule is not removed at thyroidectomy (Stathatos and Nikolaos, 2019).

The thyroid gland and its neighboring structures have a rich lymphatic supply that drains the thyroid in almost every direction. Within the gland, lymphatic channels occur immediately beneath the capsule and communicate between lobes through the isthmus. This drainage connects to structures immediately adjacent to the thyroid and to the regional lymph nodes (Wei et al., 2023).

The superior thyroid artery divides on the gland into an anterior branch that runs down to the isthmus and a posterior branch that runs down the back of the lobe and anastomoses with an ascending branch of the inferior thyroid artery. In thyroidectomy, the artery is ligated close to the upper pole to avoid damage to the external laryngeal nerve (Sharma et al., 2018).

Total Thyroidectomy and Postoperative Care

The patient is positioned with the neck extended. Rolled towels are placed under the shoulders to allow sufficient neck extension, and a sponge doughnut is placed under the occiput for adequate head support. The surgical field is draped from below the sternal notch up to the chin and on the posterior margin of the sternocleidomastoid muscles (Guzzetti et al., 2024).

A horizontal skin and platysma incision is followed by elevation of the flap. Vertical midline division of the cervical fascia and separation of the strap muscles exposes the gland. The strap muscles are retracted on one side, and the middle thyroid vein is ligated and divided. Retraction exposes the upper thyroid pole, and the superior thyroid vessels are ligated close to the gland. The gland is then dissected from the trachea and removed (Lee et al., 2024).

Haemostasis may be checked while performing a Valsalva manoeuvre under general anaesthesia, with the patient head down to open any venous bleeding. For closure of the thyroidectomy wound, the patient's head is slightly flexed to remove tension on the prethyroid muscles. The prethyroid muscles are approximated with sutures, and the platysma is reapproximated with absorbable sutures. Drains should be brought beyond the ends of the incision (Pacilli et al., 2022).

The surgical site should be monitored for lymphatic leaks, and patients should be instructed on proper drain care if a drain has been placed. Drains should be removed once output decreases to an acceptable level (Biello et al., 2024).

Post-Thyroidectomy Complications Related to Drainage

Hemorrhage and Hematoma

Thyroid arteries must be ligated with great care during thyroidectomy. Knowledge of the anatomical variations of the superior and inferior thyroid arteries is crucial for minimizing intraoperative hemorrhage and preventing inadvertent injury to adjacent nerves and structures. Variations in the origin and course of these arteries can significantly affect surgical planning and hemostasis, as accidental division or retraction of vessels such as the middle thyroid vein complicates identification and increases bleeding risk.

An expanding haematoma can cause life-threatening airway compression postoperatively. The surgical incision must be opened at the bedside and the haematoma evacuated. The airway must be secured immediately, and the patient returned to theatre for exploration and control of the bleeding site.

Seroma and Wound Infection

Seromas occur in the early postoperative period and are more common with large goitres due to the greater associated dead space created following resection. Needle aspiration is usually sufficient treatment for this complication (Randolph, 2020).

Infection may occur in approximately 2% of cases. To minimize infection, aseptic surgical technique should be used, and prophylactic antibiotics may be considered in high-risk cases (Randolph, 2020).

Chyle Leak

A chylous fistula has been observed after extensive neck dissection and during re-operative surgery due to injury of the thoracic duct. When injury is identified during surgery, the duct should be ligated. A postoperative chylous fistula that does not seal within 48–72 hours usually requires operative re-intervention (Fundakowski et al., 2018).

Classification of Surgical Drains

Surgical drains can be classified according to mechanism, nature, disposition, location, and property, as shown in Table 1.

Table 1. Classification of drains

Based on factor	Type	
Mechanism	Passive	Active
Nature	Tube	Sheet\flat
Disposition	Open	Closed
Location	Internal	External
Property	Inert	Irritant

Passive Rubber Drains

Passive drains act by capillary action, gravity, or fluctuation of intracavity pressure. Corrugated rubber drains, Penrose drains, and sump drains are examples of this type. These drains are used when the drainage fluid is too viscous to pass through tubular drains (Abozied et al., 2024).

Sheet drains are made in the form of gutters or parallel tubes through which fluid passes. A corrugated rubber drain, in which fluid tracks through the gutters to the surface, is one commonly used example of this type of drain (Schietroma et al., 2017).

Active Suction Drains

Active drains are tube drains aided by active suction, which may be low continuous, low intermittent, or high suction drainage. Jackson-Pratt drains, Surgivac drains, and Redivac drains are examples. Reliable measurement of effluent can be performed. There is a decreased risk of wound infection, minimal tissue trauma, and no skin excoriation; however, regular activation of the reservoir is often required (Abozied et al., 2024).

Closed drains are hollow tubes of varying materials brought out through a body orifice or stab wound and connected to a closed system of sterile drainage. The risk of skin excoriation and surgical wound infection is less, and effluent can be collected and measured easily. However, reflux of the contents of a contaminated reservoir has been noted (Schietroma et al., 2017).

Comparison Between Active Suction and Passive Rubber Drains

The major differences between active and passive drains are summarized in Table 2 (Abozied et al., 2024).

Table 2.

The major difference between active and passive drains **(Abozied et al., 2024).**

	Active	Passive
Function	Work by active suction	Depend on pressure differentials
Pressure gradient	Negative pressure (low ,moderate and high)	Positive pressure
Drain exit site	Dependant position not necessary	Dependant position necessary for best function
Drain site dressing	Minimal or not required	Bulky to absorb fluid output
Measurement of effluent	Reliable and accurate	Difficult to quantify
Fluid recollection	Unlikely because negative pressure improve tissue apposition	Likely because of limited effect on the dead space
Retrograde infection	Lower incidence	High incidence
Obstruction of drain	More common	Less common

Radiographic studies	Easy to perform	Difficult except in special circumstances like T-tube
Pressure necrosis	High incidence	Low incidence

Purpose of Drains After Thyroidectomy

- Therapeutic: Post-thyroidectomy drains facilitate the evacuation of blood and serous fluid from the surgical site, helping to prevent hematoma or seroma formation and promoting proper wound healing (Mujagic et al., 2019).
- Palliative: Although less common in thyroid surgery, drains may occasionally be used to alleviate pressure or fluid accumulation in patients with a compromised airway or after extensive neck dissection (Mujagic et al., 2019).
- Diagnostic: Drains can assist in the early detection of postoperative bleeding or chyle leak, allowing timely intervention and reducing the risk of complications (Wang et al., 2017).
- Prophylactic: The use of drains helps prevent fluid collection in the thyroidectomy bed, which could otherwise lead to wound complications or delayed recovery (Mujagic et al., 2019).

Complications and Limitations of Surgical Drains

- Tissue reaction: The tissue reaction associated with irritant drains may be enormous and detrimental. Careful selection and use of non-irritant drains should prevent this complication (Martins et al., 2018).
- Source of contamination: A drain is a conduit that allows opposite traffic, increasing the possibility of surgical-site infection. Strict aseptic technique and proper drain care can limit the rate of surgical-site infection. Antibiotic coverage may occasionally be necessary in susceptible patients (Martins et al., 2018).
- Delayed return of function: The presence of a surgical drain may delay return of function. Early mobilization is paramount (Mujagic et al., 2019).
- Retained foreign body: This complication may occur if the drain disintegrates due to enzymatic action, trauma, or excessive traction. Proper drain selection, careful postoperative care, and timely removal are essential to prevent this problem (Mujagic et al., 2019).
- Prolonged healing time: A drain is a foreign body; therefore, its presence in the tissue may delay or prolong wound healing. Every drain must be removed when it is no longer needed (Voss et al., 2021).
- Obstruction or failure to function may occur, particularly when the drain is not placed at a dependent site.

Practical Considerations in Drain Selection

Tube drains are hollow tubes of varying materials brought out through a body orifice or stab wound. When connected to a bag, they become closed drains; when left alone, they remain open drains. Multiple holes at the end are necessary in case one hole becomes blocked (Schietroma et al., 2017).

Passive rubber drains depend on capillary action, gravity, or intracavity pressure, whereas active suction drains use negative pressure. Active drainage allows reliable and accurate measurement of effluent, while passive drainage is more difficult to quantify. The dependent position of the exit site is necessary for the best function of passive drains but is not necessary for active suction drains (Abozied et al., 2024).

The surgical site should be monitored for lymphatic leaks, and patients should be instructed on proper drain care. Drains should be removed once output decreases to an acceptable level (Biello et al., 2024).

Conclusion

Post-thyroidectomy drains facilitate the evacuation of blood and serous fluid from the surgical site and can assist in the early detection of postoperative bleeding or chyle leak. Passive rubber drains act by capillary action, gravity, or fluctuation of intracavity pressure, whereas active suction drains use negative pressure and permit reliable measurement of effluent. Both systems have specific advantages and limitations. Active suction drains require reservoir activation and may be more prone to obstruction and pressure necrosis, whereas passive rubber drains require a dependent position, bulky dressing, and are more difficult to quantify. Drains may also produce tissue reaction, act as a source of contamination, delay return of function, or prolong wound healing. Careful

drain selection, strict aseptic care, regular monitoring, and timely removal are essential. Every drain must be removed when it is no longer needed.

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