

Close suction drain system made with 20 cc syringe and nasogastric tube (Ryle's tube) for head and neck surgery: a Technical Note

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Abstract:The first ever recorded historical evidence for surgical drains were found in the era of Hippocrates (circa 460-377 BC). The Greek Physician Hippocrates used hollow tubes for the treatment of empyema. Surgeries of the head and neck region are associated with clinically significant post-operative morbidities such as haematomas, seromas, surgical site infection and skin flap complications. "Closed surgical drains" are used widely to prevent such complications and is considered the standard of care for head and neck surgical wounds as they obliterate the dead space and prevent seroma and hematoma formation. The negative pressure created by a closed surgical drain improves the skin apposition and wound healing, particularly when extensive undermining had been done during dissection. "Radivac drains" (negative suction drains) are considered the standard of practice in head and neck surgery. However, the limited affordability of the healthcare systems in developing countries, drive clinicians to find cheaper alternatives to Radivac drains. This article elaborates the use of closed suction drain system assembled with 20cc syringe and Ryle's tube which has been effectively used in the University Dental Hospital Peradeniya for decades.

Keywords: Surgical drains, Head and neck surgery, Radivac drains, Syringe and ryle's tube.

INTRODUCTION

The historical evidence of using surgical drains was found in the era of Hippocrates (circa 460-377 BC). The Greek Physician Hippocrates used hollow tubes for the treatment of empyema (Amir I *et.al.*, 2010). History of surgical drains highlights important landmarks such as the introduction of urinary catheters by Erasistratus of Alexandria, use of Lead and brass conical tubes by Aurelius Celsus (2 AD) of Rome and use of leaden tubes by Claudius Galen (130-201 BC) for the relief of ascites (Amir I *et.al.*, 2010). Design and use of surgical drains have evolved much since then.

"Closed surgical drains" are used widely to prevent post-operative complications such as haematomas, seromas, and surgical site infections and considered as the standard of care for head and neck surgical wounds as they obliterate dead space. The negative pressure created by closed surgical drains improves the skin apposition and wound

healing (Memon M A *et al.*, 2001).

"Radivac drains" are considered the standard of practice in head and neck surgery. However, the limited affordability of the healthcare systems in developing countries, drive clinicians to find cheaper and effective alternatives. This article elaborates the use of alternative close suction drain system made from freely available surgical material used in the University Dental Hospital Peradeniya (Memon M A *et al.*, 2001). Though used commonly in Sri Lanka, this system was not described in the literature. We believe this technical note would help to add a scientific validity and to improve the system more effectively to provide a better care for our patients in underprivileged healthcare settings.

MATERIALS & METHODS

Close suction drain design

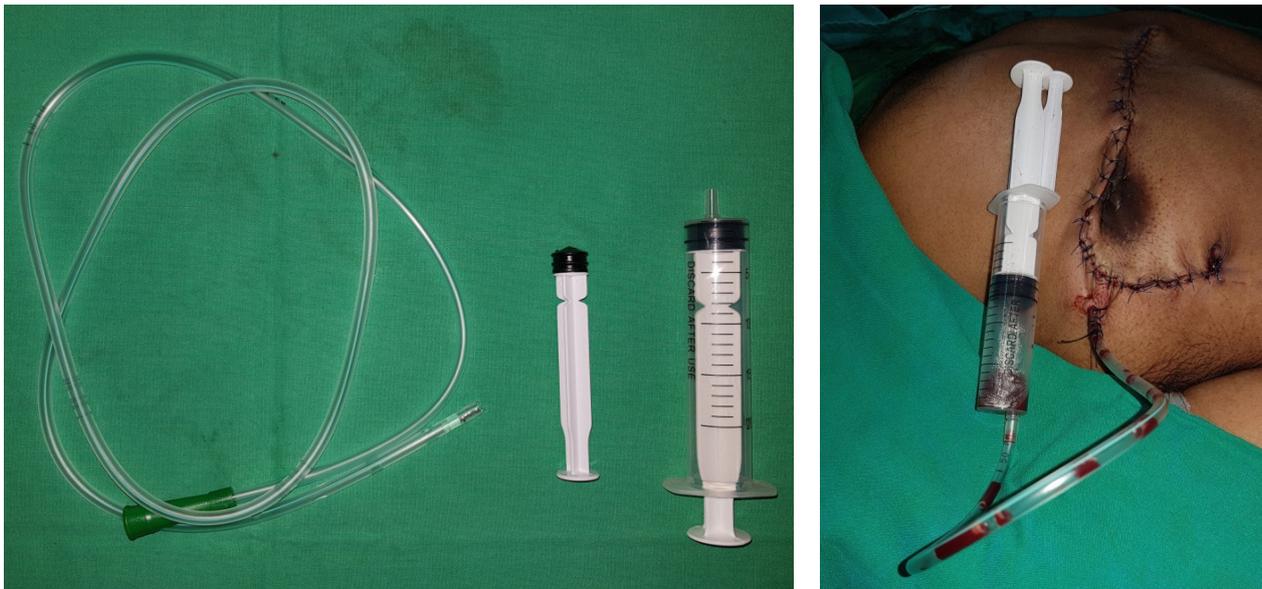
This close suction drain system was assembled using a Ryle's tube, a sterile 20cc syringe and a plunger of a 3cc or 5cc syringe (Figure 1a). The blunt end in the Ryle's tube avoids trauma while placing into the surgical site. If the Ryle's tube has to be shortened (Cutting the tube short) to adjust the length (of the drain), sharp ends should be prevented to avoid trauma and pain. Further, side holes can be made on the tube if the fenestrations at the end of the Ryle's tube are not adequate for drainage (Cutting with scissors or Scalpel). The diameter of the Ryle's tubes (Drains) could vary with clinician's preference.

As shown in figure 1b, Ryle's tube is connected to a 20cc syringe to complete the closed suction drain system. The Proximal end of Ryle's tube can be modified to achieve better fixation to the syringe. The point of connection can be further secured with a plaster. After wound closure, the function of the suction drain can be examined by withdrawing the plunger of the syringe (creating a negative pressure inside the system). Maintaining the negative pressure in the system is an important aspect of this close suction drain. Negative pressure can be adjusted by fixing a plunger of a 3cc or 5cc syringe by placing it between plunger head and barrel of the 20cc syringe as shown in

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a. Ryle's tube, 20cc Syringe, and 3 cc syringe plunger

b. Assembled close suction drain

Figure 1: Negative pressure drain assembled with Ryle's tube and syringe.

figure 1a. A plaster can be wrapped around the two plungers for stability.

There is a possibility of infection being sucked into the system if the system fails to maintain negative pressure while removing the drains. Therefore, bending the Ryle's tube close to the insertion point to the 20 CC syringe prior to emptying the collected blood avoids air leakage into the system.

Unlike in the commercial product with a screw tight seal, a concern we had with our system was the possible microbial contamination and wound infection. To exclude the above fact, collected blood in the 20CC syringe on the second postoperative day was sent for gram staining, culture, and sensitivity. Five such random samples showed no growth of any organisms confirming that this system was adequately sealed to avoid contamination. In addition, drain site infection of wounds was not encountered routinely in our practice. In most cases, the drain was removed on the third postoperative day.

RESULTS AND DISCUSSION

Cost of surgical consumables encompasses a major portion of surgical expenses. This places a huge burden on the healthcare systems in the developing world. The described closed drainage system served as a cheaper alternative to the more expensive Radivac drains and had been successfully used in head and neck surgeries by the Oral and Maxillofacial Surgery Unit of the University Dental Hospital, Peradeniya, Sri Lanka with no significant complications.

Surgical drain systems have their well-described complications when retained over a long period. They include postoperative pain and discomfort, scarring at the insertion site, and potential risk of wound infection (Amir

I et.al. 2010; Memon M A *et al.*, 2001; Panda, K N 2015). Further, continuous fluid or blood collection influence the timing of drain removal thus the duration of hospital stay (Amir I *et al.* 2010; Memon M A *et al.*, 2001; Panda, K N, 2015). The exact indications to retain a drain vary from different clinicians. The routine practice is to remove when drainage falls below 25mL/24-hour period. However, most surgeons agree that drains should be left in-situ for a further 24 hours until the volumes were re-measured. According to literature, a suction drains used in head and neck surgeries are removed in 2-4 days in the absence of complications (Amir I *et al.* 2010; Panda, K N 2015). The presence of suction drains encourages serous fluid drainage due to tissue reactions caused by the suction effect.

Structure and function of this cheap drain system reflect Radivac drains in many aspects. However, several drawbacks were encountered during its use. The irregular margin at the cut end when adjusting the length of the Ryle's tube due to its texture may traumatize the surgical site and blood vessels leading to post-operative pain and bleeding. This emphasizes the importance of eliminating sharp ends. Creating supplementary fenestrations on side walls for better drainage may weaken the Ryle's tube. This may lead to breakage of the Ryle's tube during removal. Care should be taken to create smaller holes at a reasonable distance without weakening the tube. The limited volume of the 20 CC syringe necessitates frequent opening and removal of the collected blood which risks contamination. Using a larger volume (50CC) syringe may be heavy with collected blood and the tight fix with the Ryle's tube may be compromised.

When benefits are considered, obvious cost-effectiveness and the ease of assembling were main advantages of the current close drain system. A similar mini suction drainage system made up of a 20cc glass syringe, a stainless steel

spring and a scalp vein cannula was described by Singh A *et al.* in 1992. Even though it shared mechanical similarity to Radivac and current drain system, structurally differs from both (Singh A *et al.*, 1992).

CONCLUSION

The current suction drain system was very effective in the post-surgical care of head and neck surgeries with minimal complications. Though we do not recommend replacing Radivac drains, the new drains system serves as a cheap and effective alternative, especially to be used in times of economic constraints.

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