

Injection syringe designed as surgical tools in resource limited settings

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Abstract:

Surgical practise in India is cut across urban and rural areas with majority of the patient hailing from economically backward rural areas having limited surgical care facilities. This is coupled with escalating cost of surgical services in private setup and limited availability of services in government hospital resulting in patients being deprived of proper surgical management. Improvisation of cheap and easily available alternative sources not only makes the cost of surgery cheaper and affordable for the patients who belongs to poor economic class. **Objective:** Surgical innovations have a classic culture and deep tradition. It is a mental fabrication of preformed idea coupled to hands on application. It's the surgeon's responsibility to discover, translate and propagate such ideas to de-escalate surgical cost for the poor socio-economic patients in India. This article addresses one such issue. This article focuses on improvisation of injectable syringes as surgical tools.

Study design: This study carried out at rural area of Kolkata by department of Surgery Nil Ratan Sarkar Medical College Hospital, Kolkata, West Bengal

Place and duration of study: This is a retrospective study conducted at rural area of Kolkata being carried out by Nil Ratan Sarkar Medical College Hospital, Kolkata, West Bengal from 1st of February 2018 till 31st January 2020.

Material and Methods: All cases who underwent choledochotomy from 1st February 2018 till 31st January, 2020, the T tube is connected with 50cc syringe with drain bag.

Results: Among 91 cases who underwent choledochotomy from 1st February 2018 till 31st January, 2020, the T tube was connected with 50cc syringe. We noted biliary leakage in 7 cases (7.69%). This method was successful in 84 cases (92.31%).

Conclusion: Improvisation of cheap and easily available alternative sources not only makes the cost of surgery cheaper and affordable for the patients but also gives satisfaction to the surgeon as proved by above study.

Keywords: syringe, innovation, surgery, choledochotomy, T tube

Introduction:

The Covid pandemic has put our world into a deep economic crisis. It has affected all fields of life, the main brunt of which was borne by the developing and underdeveloped nations. Escalating cost of surgical treatment along with growing unemployment has forced common people to venture for economic surgical treatment carried by unqualified quacks. This has given rise to numerous unprecedented post-

surgical complications putting their lives into great risk. Risk and cost curtailment of surgical expenditure is the need of the hour. We as surgeons amalgamated commonly used surgical items with scientific knowledge to device surgical tools which not only de-escalates cost but are efficient and handy for use. Our article focuses on one such commonly used item (injection syringe) to device tools for routine use in daily surgical practice. Though some of these have been

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Figure 1: Syringe as a T tube connector



Figure 2: Syringe suction drain for small cavity superficial wounds



Figure 3: Syringe skin hook

devised before their resurgence and reuse would be of benefit to surgeons practicing in poor economically backward areas.

Higher expense in surgical procedures is the primary cause of its lower priority in health care planning programs of economically backward countries. As such a vast majority of the population are deprived of access to surgical care. Under developed countries constitute about 35% of the surgical burden though only 3.5% surgical procedures are performed due to economic

constrains.^{1,2}

One of the methods to curtail surgical cost in such settings is improvisation of surgical tools with commonly used devices. Though many of these innovations have historical background, descent with modification have increased their efficiency and utility among rural surgeons.³ This article focuses on improvisation of injectable syringes as surgical tools, which results in decreasing down the cost of surgery and surgical instruments and tools.

The improvisations: T tube drainage of the common bile duct is a bail out option after choledochotomy. T tubes does not have an external connector device unlike other drainage systems commonly used in general surgery. The sequel is a disparity in the luminal diameter of the T tube and tube of drainage bag resulting in bile leak. A simple and effective method to overcome this problem is to connect the extra corporeal end of the T tube with the hub of a syringe (2 to 5 ml). The plunger is removed from the barrel. The barrel is then connected with the funnel shaped inflow port of the drainage bag as shown in figure 1. This prevents bile leak from the junction of T tube and tubing of drainage bag, due to snugly fitted inflow port of the bag with the barrel of the syringe.

Other uses of syringe as a surgical tool was performed after draining and abscess cavity and superficial wounds. The syringe used as suction drain for small cavity superficial wounds as shown in figure 2.

The syringe suction system consists of two parts a) Syringe assembly and b) Infant feeding tube of varying size (No 6/8) depending on need. The syringe assembly consists of a 20 cc or 50 cc syringe and a 2-cc syringe plunger. A negative suction is applied on the syringe (20/50 cc) connected to the female mount of infant feeding tube while its male end remains inside the wound cavity.

The 2-cc plunger is inserted between the plunger top and the flange of the syringe thus creat-

ing negative suction. The whole system is secured by surgical tapes to a suitable position of the torso. The syringe is discharged and recharged time to time depending on the amount of collection.

Syringe skin hooks may be designed to manipulate skin borders during surgical procedure when standard skin hooks are not available. The needle (preferably 26 gauge) is bent to create the desired hooked effect. This is attached to a syringe with Leur lock system to create the assembly. Further the needle cover is placed in between the plunger top and flange for length adjustment. This has the advantage of sterility and is quick and easy to manufacture. Further the plunger can be manipulated to adjustable length. Per-operatively the needle can be used as a suture passer. At the end of the operation the same syringe can be used to infiltrate the skin margin with local anaesthetics.

Material and Methods:

This is a retrospective study conducted at rural area of Kolkata, carried out by department of Surgery, Nil Ratan Sarkar Medical College Hospital, Kolkata, west Bengal from 1st of February 2018 till 31st January 2020. After approval from hospital ethical committee, a total of 91 consecutive cases of Cholelithiasis who underwent choledochotomy admitted in the peripheral hospital of Kolkata were included in the study.

The cases of Cholelithiasis of age between 18-65 years and either gender were included in the study. Those cases who has history of malignancy, associated pancreatitis and cardiac impairment are excluded from the study.

The informed and written consent was taken from all patients. Detailed history and thorough examination and relevant investigations of the patients were done. Exclusion criteria were strictly followed to reduce bias in the study. All cases who underwent choledochotomy from 1st February 2018 till 31st January, 2020, the T tube is connected with 50cc syringe with drain bag.

All the data was recorded on a standardized proforma. Bias and confounders in the study were controlled by strictly following the exclusion criteria. The data was analyzed using statistical software SPSS-21. Frequencies and percentages were calculated for categorical variables like gender. Mean \pm SD was calculated for numerical variables like age.

Result:

We included 91 patients of age ranging from 18 – 65 years with a mean age 42.84 ± 8.82 years. Out of 91 patients there were 63 females (69.23%) and 28 male (30.77%) patients. Female to male ratio was 2.25:1. All patients with choledochotomy the T tube was connected with 50cc syringe which is connected to drain bag. We noted biliary leakage in 7 cases (7.69%). This method was successful in 84 cases (92.31%).

Discussion:

Surgical practise in India is cut across urban and rural areas with majority of the patient hailing from economically backward rural areas having limited surgical care facilities.⁴

This is coupled with escalating cost of surgical services in private setup and limited opportunities in government hospital resulting in patients being deprived of proper surgical care.⁴ Improvisation of cheap and easily available alternative sources not only makes the cost of surgery cheaper and affordable for the patients but also gives satisfaction to the surgeon.

Conclusion:

We strongly recommend that this T tube drainage system should be used in people with poor socioeconomic group and in those areas where health facilities is not available to reduce the cost of surgery. Simultaneously this syringe method can be used as a negative suction tubing system to curtail the cost of surgery.

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Role and contribution of authors:

Dr Sucheta Sarkar, collected the data, references and did the initial write up.

Dr Bhaskar Barai, collected the data, references and helped in introduction writing.

Dr Ritankar Sengupta, critically review the article and advised useful changes.

Prof Dr Utpal De, went through the article critically and made the final changes in the article.

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