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A Simple Method to Control Scalp Flap Bleeding by Plastic Clips Made from Disposable Syringe Barrel as an Alternative Method to Raney Clips in Cranial Surgery

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Abstract

Among the haemostatic instruments used in neurosurgery, Raney clips have got several advantages. Surgeons working in low resource setting in developing countries like India could not routinely use Raney clips due to non-availability and relatively high cost. Plastic clips made from barrel of disposable syringe are a viable alternative to Raney clips. Plastic clips made from disposable syringe barrel is very easy to make, since readily available in sterile form autoclaving not needed, non-toxic, non-pyrogenic, transparent, and cheaper than Raney clips. So we consider it as a very cost effective in neurosurgical operation theatres.

Keywords: Scalp flap; Haemostatic instruments; Raney clips; Disposable syringe barrel made plastic clips

Introduction

Scalp flap edge haemostatic methods in Neurosurgery can be categorised into three types in modern Neurosurgical practice [1-4]. Electro cautery, Mechanical compression and Vasoconstrictive drug infiltration methods are used in combination [1]. The mechanical compression method evolved from finger pressure, ligatures, rubber band, Esmarch bandage, inflatable tourniquet, Cushing's forceps to Raney clips [1,5,6]. Even though the spring scalp clips of Raney introduced in 1936 and revolutionized our current conception of scalp haemostasis in Neurosurgery [1,2,7,8]; in several parts of the world, disposable clips often continue to be prohibitively expensive and not available. This article discusses economically viable disposable syringe barrel made plastic clips which we have used for surgery in neurosurgery department. This technique would be a great help to young surgeons particularly working in District and Sub divisional hospitals and in developing countries where economics play a major role in surgery.

Materials and Methods

Surgical method

On table with full operation suit with strict aseptic precautions, after removing the pistons of 2 ml disposable syringes, the remaining plastic barrel is cut in to 2 cm cylinders and opened vertically in wavy fashion length wise using 11 blade and heavy Mayo scissors (**Figures 1-11**).

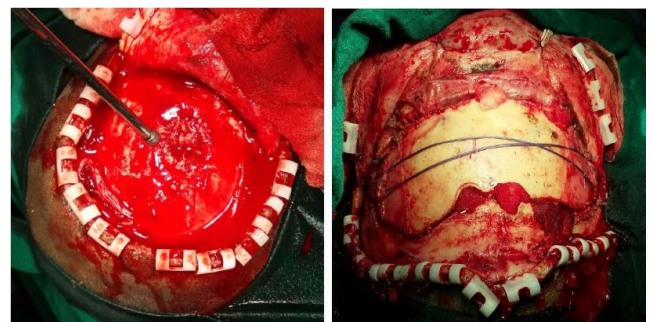


Figure 1 Raney clips in cranial surgery.

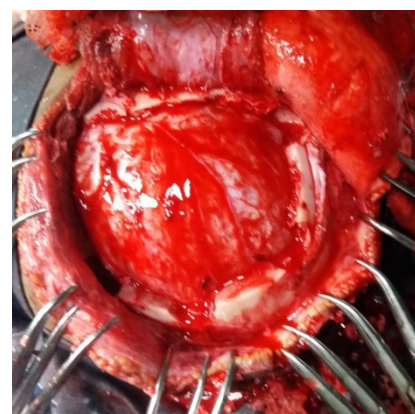


Figure 2 Dandy's hemostatic forceps in cranial surgery.

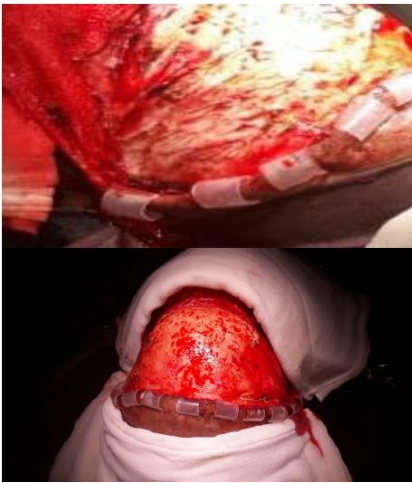


Figure 3 Disposable plastic syringe barrel made clips in cranial surgery.

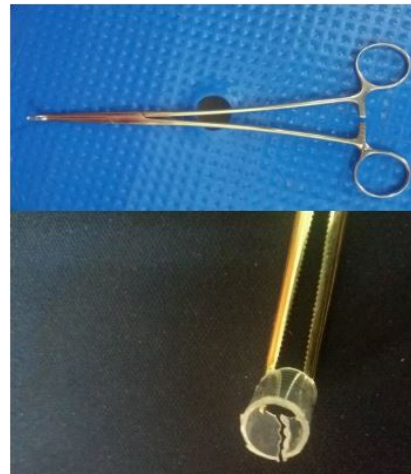


Figure 6 Right angled forceps for disposable syringe made clip application.



Figure 4 Disposable plastic syringe barrel made clips.



Figure 7 Raney clip applicator forceps.



Figure 5 Raney clips.



Figure 8 Post-operative healthy scar with disposable plastic syringe barrel made clips.



Figure 9 3 mm mouth opening force recorded for Raney clips with electronic weighing scale.



Figure 10 3 mm mouth opening force recorded for syringe made clips with electronic weighing scale.



Figure 11 Electronic vernier caliper used to measure clip mouth opening force.

With informed consent Prophylactic routine antibiotics were administered with pre-operative head shave for all patients. The scalp bicoronal or any scalp incision was marked according to the craniotomy [7,9-12]. 10 ml of 2% Lignocaine

hydrochloride containing 1:200,000 adrenaline was taken, diluted with equal amount of normal saline and infiltrated along the incision [1,8]. This helps in defining planes during dissection for young surgeons [1]. The incision is then begun carrying through it the skin, subcutaneous tissue and underlying layer to the loose aponeurotic layer. Electrocautery was avoided for the initial incision to avoid damage to hair follicles. Text-books have recommended the use of Raney clips to control bleeding from the scalp. At this point the disposable syringe barrel made plastic clips were applied to the flap serially at 2 cm gap between the clips after the flap was undermined using right angled artery forceps. The flap was then reflected in a standard fashion. The clips were intermittently released to prevent pinching or pressure on the skin

After completion of the surgery the clips were released and bleeders were treated by electrocautery. A 12 FG size vacuum suction drain was placed and the wound closed in two layers. The pericranium and muscle are closed with 2-0 vicryl and staples used for the skin. An external dressing was given and staples removed after 1 week. All patients had an uneventful healing. The clips were discarded after use.

Experimental method

The mouth opening force for Raney clips and Disposable syringe barrel made clips recorded using portable electronic weighing scale and electronic vernier caliper is used to measure mouth opening distance in mm and compared.

Results

Surgical method

- Total number of cases operated using this method 21 (male-19, female-2).
- Disposable Syringe barrel made clips application time during surgery range from 1-5 minutes.
- Additional intra operative blood transfusions done cases-zero.
- Intra operative scalp and brain injury due to clips- zero.
- Post-operative scalp necrosis-zero.
- Post-operative delayed wound healing cases-zero [13].
- Post-operative wound infection due to clips-zero.
- Post of surgical scar healthy in all cases.
- Allergic reaction due to clips-zero.
- Post-operative Hair loss noted in no cases [14].

Experimental method

Mouth opening force recorded in kilograms with portable electronic weighing scale and electronic vernier caliper summarised in **Table 1** shows only minimal difference for both

clips. The mouth opening force can be indirectly taken as scalp compression force of clips.

Table 1 Comparison of mouth opening force measured for Raney clips and disposable syringe barrel made clips using portable electronic weighing machine.

S. No	Clip mouth opening force measured in mm using portable electronic weighing scale	Raney clips	Disposable plastic syringe barrel made clips
1	1 mm	0.193 kg	0.190 kg
2	2 mm	0.386 kg	0.380 kg
3	3 mm	0.580 kg	0.575 kg
4	4 mm	0.772 kg	0.765 kg
5	5 mm	0.965 kg	0.960 kg

Discussion

The idea of replacing Raney clips germinated with the thought that the Raney clip is essentially a clip which provides pressure for haemostasis just like any spring clips [2,15-17]. Since Raney clip and disposable syringe barrel made clips are plastic material and having approximately same amount of elastic recoil when open wide and gives same amount of compression force when applied to the scalp flap edge [7,8,17]. The diameter of 2 ml syringe barrel and thickness are also approximately same with the Raney clips. An evaluation of personal records from 1st Jan 2015 to 31st Jan 2018 showed 21

patients (19 male, 2 female) operated in this fashion. No case had complications of excessive bleeding. All patients were followed up for a minimum of 6 months and showed no problems which could be associated with the use of the clips. There would be a logical argument that these are not originally meant for surgery and does not warrant use. We feel that since we have not implanted inside the body and it is just used to hold the flap, this is acceptable. Moreover all patients were informed that we would be using these clips just to hold the flap and nowhere near or inside the vital structure like brain, and had taken consent for the same (**Table 2**).

Table 2 Comparison of Raney clips, Dandy haemostatic forceps and disposable plastic syringe barrel made clips.

S.no	Parameters	Raney clips	Dandy's forceps	Disposable syringe made clips
1	Cost	30-60 INR per clip	800-2000 INR per forceps	Four clips can be cut from each syringe costs five INR, very cheap
2.	Size	Small, not interfering with surgical field due to slim design	Long, interfering with surgical field	Small and slim, not interfere with surgical field
3	Safety	Safe and reliable prevention of bleeding	Can injure adjacent vitl structures	Safe and reliable
4	Design	Atrumatic design	More trauma and crushing the scalp layers	Negligible trauma
5	Closing force	Constant	Increasing	Constant
6	Application	Fast and easy	Slow	Fast and easy
7	Sterility	Disposable for unconditional cleanness and sterility	Should be thoroughly cleaned and autoclaved before each and every use	Disposable and sterile
8	Availability	Not available in district level hospitals	Not available in district level hospitals	Available in small health care system also
9	Applicator	Separate clip applicator needed which is costs, 2000-4000 INR	Not needed	Can be applied with right angled or curved artery forceps easily
10	Post op complications	No	Scalp injury	No

Conclusion

Haemostasis during Scalp incisions can be done by galeal application of multiple traditional haemostats like Cushing forceps. But plastic clips effect gentle pressure with no flanges

or protrusions and bulk to hamper surgery this takes time as compared to our method of using clips which not only prevents bleeding but also aids to hold the flap during dissection. This method will reduce the learning curve for young surgeons and help them to attempt the coronal incision

with confidence. Once expertise is achieved then the surgeon can decide whether he wants to continue their regular use.

Conflicts of Interest

The authors declare no conflict of interest.

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