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RESEARCH ARTICLE

INNOVATIVE USES OF SYRINGES IN ORTHOPAEDICS

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ABSTRACT

This article depicts the innovative techniques using syringes in orthopaedics. Syringes are commonly used in orthopaedics since long. Using syringes in commonly performed procedures in Orthopaedics in various ways is not only economical but patient friendly also. This article depicts the few innovative techniques involving the use of syringes as suction drains in pediatric patients, as tissue protector sleeve in tibia nailing, as urinary catheter stopper, as bone cement moulds and as guard in fingers with K wires. This article incites the use of commonly available material in Orthopaedics in innovative naïve ways to utilize items to their maximum potential.

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INTRODUCTION

A syringe is being used in medical science since long. The mention of such instrument used in medical science dates back to 9th century AD. The modern day syringe we are used to work with was introduced in late 18th century. The design of syringe has been improved since then. Initially glass was used later plastic is introduced to manufacture the body of syringe. The syringe with needle is mainly used to deliver drugs intramuscularly, subcutaneously, intra dermal & intravenously. A syringe is a pump with a plastic or glass barrel with a plunger or piston with fits tightly in it. The plunger can be pulled to fill the barrel and pushed to empty the contents in the barrel. This article depicts some innovative uses of syringes in field of orthopaedics.

Suction drain in pediatric patients: Suction drains are being used in orthopaedic surgeries since long (Gaines, 2008). Negative suction drains are used in various types of orthopaedics surgeries like arthroplasty, arthroscopy, trauma surgeries and arthrotomies (Moss, 1981). Suction drains are generally placed in joint cavity and body spaces to prevent accumulation of discharges and fluids (Gaines, 2008; Tucci *et al.,* 2006).

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Post surgery drains are placed to drain out the discharges from surgical site and prevent accumulation of blood, which act as culture media for infectious agents. Thus suction drains not only prevent infections, they also reduces surgical site soakage, swelling and faster recovery (Smith and Shapiro, 1997; Khanal *et al.,* 2011). Various sizes of suction drains are available ranging from 8FG to 18FG. Smaller sizes are used in pediatric age group. Arthrotomies are very common surgery done for septic arthritis in pediatric age group ranging from neonates to adolescents. In neonates or infants the 8FG size is difficult to place in joint cavities (hip, knee, shoulder & elbow joints). The size of 8FG draining tube is still too large to place in joint cavities in neonates and infants. Even it's difficult to place these drains in trauma surgeries in smaller children. To overcome this problem we have devised an innovative method of using smaller feeding tubes connected to syringe. Fenestrated feeding tubes of varying sizes ranging from 4FG-8FG are available. The feeding tube of required size is placed in the joint cavity with all the holes inside the joint & is connected to a 10/20/50 ml syringe. To create a negative suction the plunger of the syringe is pulled and placed in position with help of plastic tube (Figure1-3). This construct gives a negative suction with smaller tubing. The discharge or fluid collected in the syringe can be accurately measured and sent for microbiological examination. The syringe can be recharged as many times as required. This technique can be used wherever the smaller sizes of drains are not available and it's less expensive too.

Figure 1. Syringe & plunger of other syringe

Figure 2. Suction Drain with syringes applied in knee arthrotomy in an infant

Figure 3. The construct of Negative Suction Drain formed with Syringes

Bone cement mould: Bone cement is used in various orthopedic surgeries. Various types of bone cement are available in the market ranging from plain bone cement to antibiotic eluting bone cement. Antibiotic eluting cement is mainly used in arthroplasty surgeries, in the treatment of acute osteomyelitis, acute or chronic osteomyelitis and infected non union.

Figure 4. Syringe slit longitudinally

Figure 5. The Bone Cement Mould formed

The use of antibiotic eluting bone cement increases the concentration of antibiotics around 600 times at the site & reducing systemic side effects (Buchholz *et al.,* 1981). This method has proven to be very effective in eradicating the infection at the site of placement of antibiotic eluting bone cement. The bone cement can be placed either as beads or as cylindrical bars at the infection site (Seeley *et al.,* 2003). Bone cement in waiting phase is poured in the syringe (which is already being slit with the help of surgical blade) after removing the plunger and blocking the nozzle end. Varying sizes of syringes (2/5/10/20ml) can be used depending upon the thickness and length of bar required. The stainless steel (SS) wires of varying sizes can be passed through the bone cement in the syringe. The bone cement is left to set in. After the setting phase is over the syringe is cut and removed. The cylindrical bar can now be placed at infected site with the help of SS wire (Figure 4,5). The beads can be made with help of syringes. After the bone cement has been poured in the syringe in waiting phase it is pushed from the nozzle with the help of plunger slowly over the SS wire placed on the table. The bone cement is left to set over the SS wire. The beads over the SS wire can be placed at intended site.

Stopper for urinary catheter: Urinary catheters are used commonly in orthopaedic patients especially those suffering from spine pathology. Long term use of urinary catheter is associated with bacteriuria and infection (Warren *et al.,* ?; Bhatia *et al.,* 2010). Patients with spine pathology generally involve the bladder. The upper motor neuron lesions leads to detrussor hyperactivity and decrease in the size of the bladder (Roe, 1990; Fillingham, 2005). In such patients recovery requires lot of time. So meanwhile to help patient in micturition, urinary catheters are being inserted. A technique of bladder clamping is done so that the bladder is filled with urine and bladder capacity is increased. The clamping of

urinary catheter is done in bouts of 4-5 hours and released for 15-20 minutes. The clamping can be done by clamps meant for it or bandage tied around tightly the tubing of the catheter in U shaped. But this method is not efficient as t leads to leakage of urine through the tubing. The syringe without the plunger can be used to clamp the U shaped bend in the tubing. This is an efficient method which can be used to clamp in long indwelling catheters as it is easy to apply & release the syringe and it's very cheap also (Figure 6).

Figure 6. Stopper for Urinary Catheter

Figure 7. Bone Reamer passing through Syringe as Tissue Protector Sleeve with Guide Wire holding forceps

Tissue protector sleeve: The nailing of tibia and distal femur nailing is done for tibial fractures and distal 1/3 femur fractures respectively. For nailing entry point is made with the help of awl (Alms, 1962) & then varying size of reamers is used to ream the bone. The entry point for tibial nailing is anterior to articular plateau and medial to lateral tibial spine (McConnell *et al.,* 2001). The approach generally used is patellar tendon splitting. After the entry point is made reamers are to be used, but using reamer without tissue protection sleeve can be dangerous and rip off the patellar tendon. The sleeve provided with instrumentation of tibial nailing is difficult to place in a flexed knee through the taut patellar tendon. The 10 ml syringe with its nozzle end cut off can work as a tissue protector sleeve for the patellar tendon (Figure 7,8). Reamers can pass through the syringe and procedure can be done. Similarly the enrty point for DFN (Ryan J. Krupp *et al.,* 2003) is in line with the axis of the medullary canal, just below the crest of the intercondylar notch. The correct position is therefore located anterior and lateral to the proximal attachment of the posterior cruciate ligament. It's difficult to place the tissue protector sleeve via the medial parapetellar approach in a flexed knee. The 10ml syringe with cut nozzle end can be used as tissue protector sleeve and reaming can be done through it. The advantages of using syringes as tissue protection sleeve: easy to place at entry site; the guide wire can be seen through the transparent syringe so that it can be held with guide wire holder while pulling the reamer back; the bone reamer aspirate can be seen and collected in syringe for further use; it is an cheap alternative to the costly instrumentation; no issues of reusing and autoclaving the instrument as new syringe is being used every time.

Used for measuring size of pathology specimens: The graduated marking on the syringes can be used to measure pathological specimens excised in operation theatres. In the absence of proper measuring scales, the syringes come handy to measure the pathological specimen.

As Finger Guard: The syringe with plunger removed and nozzle end cut can be used as protector for fingers with K wires fixation. K wires are generally used for fixation of distal phalanges fracture. The cut end of K wire is protruding out of the finger. The syringe placed over the finger act as protector of finger from accidently getting struck leading to displacement of K wires (Figure 9).

Figure 8. Bone Reamer passing through Syringe as Tissue Protector Sleeve

Figure 9. Syringe acting as Guard for Little finger with K wire

Conclusion

All these are the few innovative ideas using easy available items in our hospitals. These methods utilize the material available in the hospitals in various ways. These are simple ways of utilizing items to their maximum potential. This article depicts the various new methods of utilizing syringes in commonly performed procedures in the Orthopaedics department in India. This is not only economical in developing countries but patient friendly also.

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