new technologies

Hemostatic Plug: Novel Technique for Closure of Percutaneous Nephrostomy Tract

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Percutaneous nephrolithotripsy (PCNL) is a standard treatment for large renal calculi. Its technique is well established; however, there is a lack of consensus regarding leaving a nephrostomy tube (NT). NT offers both drainage and possibility of reentry in case surgical revision is needed. Although placing a NT remains the most common practice, several studies have proposed tubeless approach in an attempt to minimize morbidity. The presence of a large NT is related to more severe pain and increased requirement of analgesics, urine extravasation, longer hospital stay, longer time to return to normal activities.

In many centers, surgeons have been using sealant agents to occlude skin to kidney tract in tubeless PCNL in order to decrease both bleeding and urine extravasation. Although these materials have shown safety, the best agent and the appropriate technique to use it have not been defined.

Examples of sealant agents are:

1. Gelatin matrix hemostatic sealant (FloSeal, Surgiflo)
2. Thrombin-soaked absorptive gelatin (Gelfoam) - tamponade through expansion within the tract and intrinsic hemostatic activity.

This study is the first description of a standardized technique to apply a sealant agent in tubeless PCNL. Gelfoam was used in over 200 cases.
Step-by-step:

1. Measure skin-to-calyx distance on CT scan (Parenchymal calyx interface). *(Picture 1)*
2. After removing the calculi, decide upon the possibility of not leaving a nephrostomy tube.
3. Retrieve Amplatz sheath to evaluate the transition from collecting system to renal parenchyma, which should be the limit for plug placement. *(Picture 2)*
4. Sheath extremity is kept in this interface.
5. Outside portion of sheath is measured from skin to external tip.
6. Gelfoam is cut according to CT scan measurement
7. Gelfoam is prepared after rolling on in a cigar-like fashion *(Picture 3)*
8. Gelfoam is inserted into the Amplatz sheath and 5 to 10 mL of thrombin is injected onto the plug.
9. Fascial dilator is advanced inside the sheath as a plunger to push the plug into place. Plug is pushed until it is not seen above the skin limit. *(step 5)*
10. Retract the amplatz sheath keeping the plunger in place
11. Retrograde pyelography using ureteral catheter
12. Remove safety wire
13. Suture the skin

CT scan on postoperative day 1 shows plug image as hypodense *(picture 4)*. After 4 weeks, ureterorrenoscopy allowed for direct visualization of collecting system. Complete healing of the urothelium could be seen. No calculi formation at the tip of the plug or signs of infection were encountered. Complication with advancement of Gelfoam plug beyond the interface between collecting system and renal parenchyma was noted intraoperatively, but patient had no symptoms and complete sealant reabsorption was seen at follow up ureterorrenoscopy.
Pictures:

Picture 1. Measuring distance from skin to collecting system before plug confection.

Picture 2. Parenchymal tract overview and identification of transition with collecting system. This will be the plug limit.
Picture 3. Preparing gelfoam in “cigar” fashion
Picture 4. Hipodense aspect of plug on postoperative day 1.