

Everything about suture, tie, clip and ligation devices for urologic surgery

동아의대 김태효

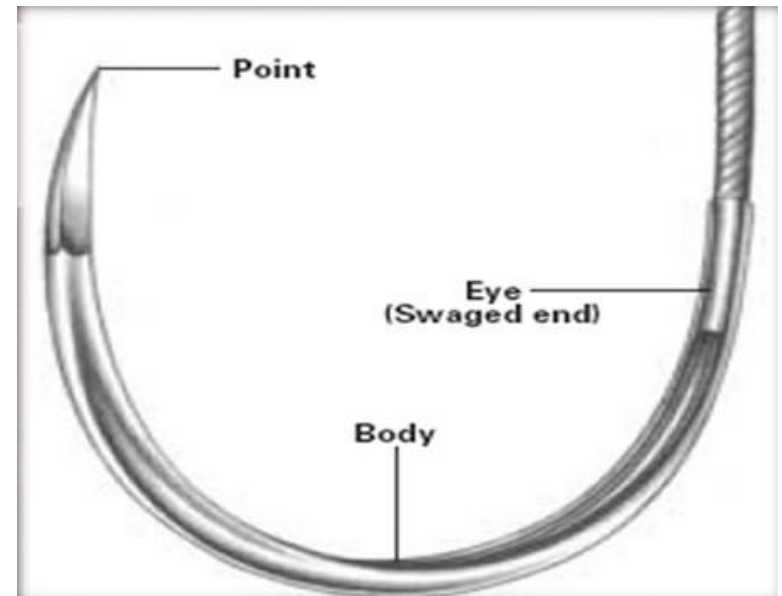
Needle

► Selection of appropriate needle :

1. requirements of the procedure
2. nature of the tissue being sutured
3. accessibility of the operative area
4. gauge of suture material being used
5. surgeon's preference

Needle

- ▶ Components : the point, the body & the swage
- ▶ The Point depends on the needle type (round or cutting)
- ▶ The Body has flattened section where the needle can be grasped by the needle holder. Some needles have longitudinal ribs on the surface which reduce rotational movement.
- ▶ The majority of surgical needles are Eyeless (already swaged to the suture material)



Needle Curve

Most surgical needles are curved :

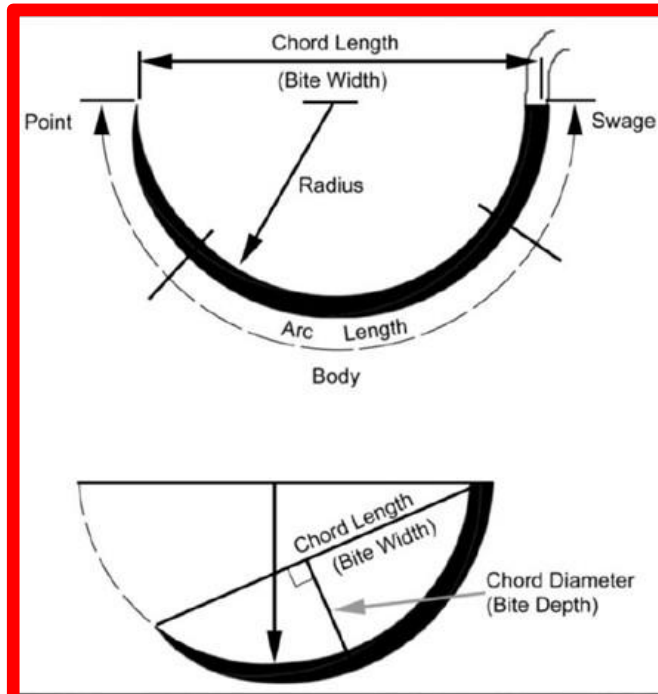
- 3/8 curve is the most common shape
- 1/2 or 5/8 curve needle are useful in small spaces
- 1/4 curve or a straight needle is adequate if there is no shortage of space
- Compound shapes include a J needle for confined spaces (as for femoral hernia repair).

- ◆ Chord length: the linear distance from the point of the curved needle to the swage (bite width)
- ◆ Needle length: The distance measured along the needle from the point to the swage
- ◆ Radius: This is the distance from the body of the needle to the centre of the circle along which the needle curves (bite depth)
- ◆ Diameter: The gauge or thickness of the needle

Needle length, not chord length (bite width), is the measurement supplied on suture packages

The needle should be long enough to:

- Pass through the tissue
- Show at the far side of the wound to be grasped by the needle holder or dissecting forceps



Needle size

<u>Size</u>	<u>Uses</u>
7/0 and smaller	Ophthalmology, microsurgery
6/0	Face, blood vessels
5/0	Face, neck, blood vessels
4/0	Mucosa, neck, hands, limbs, tendons, blood vessels
3/0	Limbs, trunk, gut blood vessels
2/0	Trunk, fascia, viscera, blood vessels
0 and larger	Abdominal wall, fascia, drain sites, arterial lines, orthopaedics

Needle cross section

(1) Round-bodied needles

- Designed to separate tissue fibers rather than cut them.
- Used either for soft tissue or in situations where easy splitting of tissue fibers is possible.
- After the passage of the needle, the tissue closes tightly round the suture material, thereby forming a leak-proof suture line which is particularly vital in intestinal & cardiovascular surgery.

(2) Cutting needles

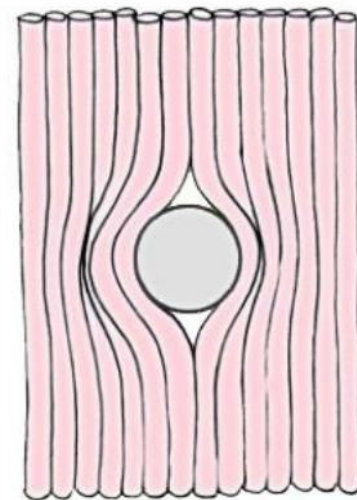
They are required where tough or dense tissue needs to be sutured.

(3) In addition, there are surgical needles for special areas :

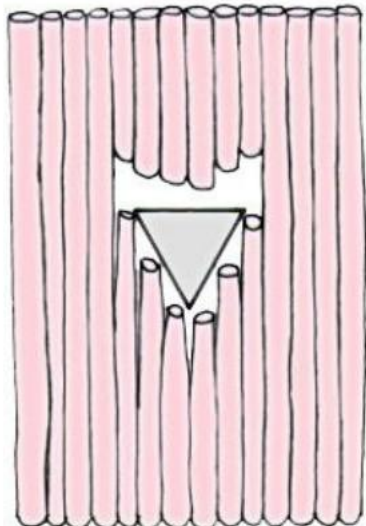
such as microsurgery, ophthalmics & endoscopic surgery.

Needle type	Description	Typical application
<u>Intestinal</u>	The hole made by this needle is no larger than the diameter of the needle. The hole is then filled by the material, which reduces the risk of leakage.	Gastrointestinal tract; biliary tract; dura; peritoneum; urogenital tract; vessels; nerve.
<u>Heavy</u>	In some situations where particularly strong needles are required, a heavy wire diameter needle would be appropriate.	Muscle; subcutaneous fat; fascia; pedicles.
<u>Blunt Taper-point</u>	Where needle-stick injury is a major concern, particularly in the presence of blood borne viruses, the blunt taper-point needle virtually eliminates accidental glove puncture.	Uterus; pedicles; muscle; fascia.
<u>Blunt-point</u>	This needle has been designed for suturing extremely friable vascular tissue.	Liver; spleen; kidney; incompetent uterine cx.

Round-bodied Needle



Cutting Needle



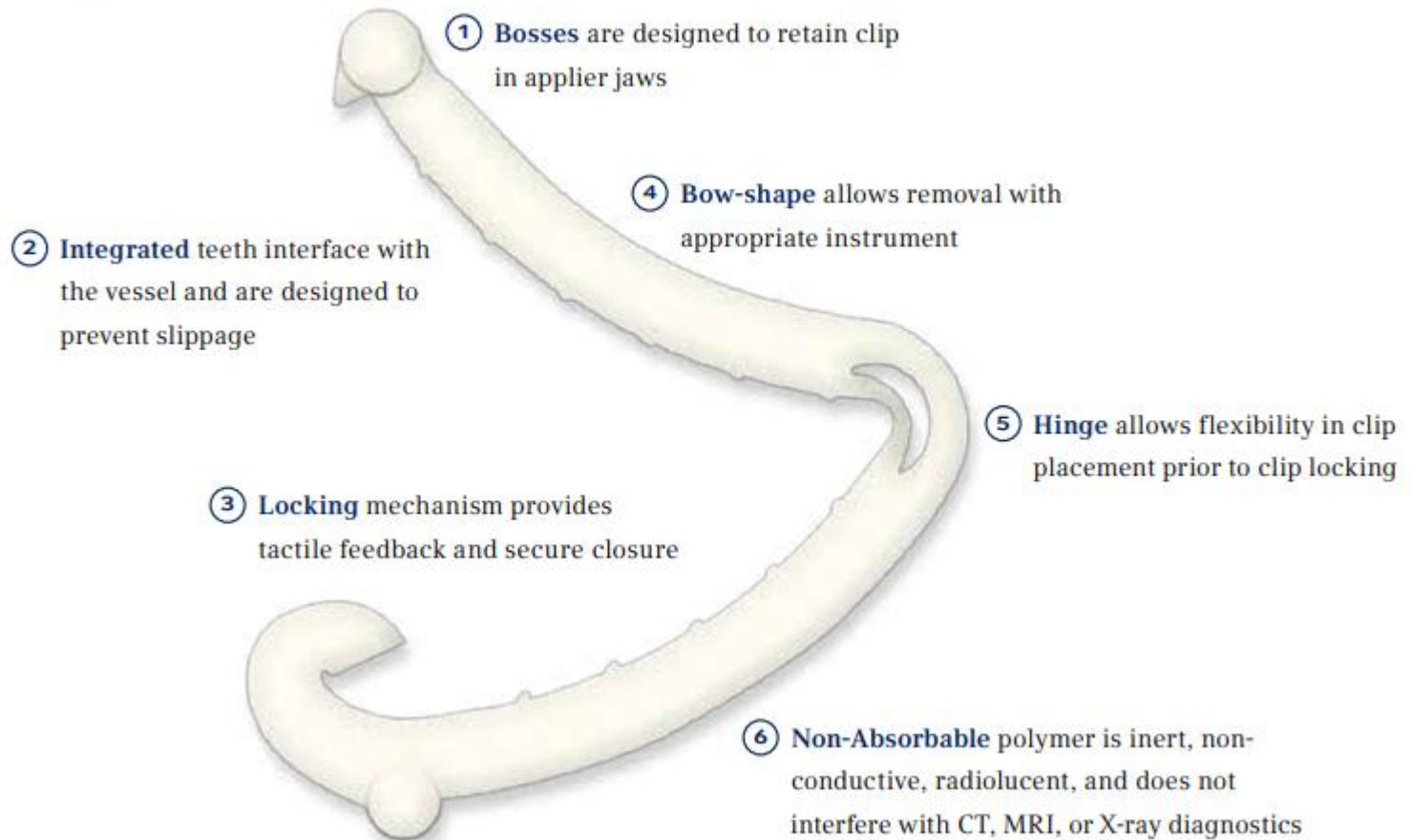
Needle type	Description	Typical application
<u>Tapercut™</u>	This needle combines the initial penetration of a cutting needle with the minimized trauma of a round-bodied needle. The cutting tip is limited to the point of the needle, which then tapers out to merge smoothly into a round cross-section.	Fascia; ligament; uterus; scar tissue.
<u>Cutting</u>	This needle has a triangular cross-section with the apex on the inside of the needle curvature. The effective cutting edges are restricted to the front section of the needle.	Skin; ligament; nasal cavity; tendon; oral.
<u>Reverse cutting</u>	The body of this needle is triangular in cross-section with the apex on the outside of the needle curvature.	Skin; fascia; ligament; tendon; oral; nasal cavity.

Clips – metal and polymer

- ▶ Disadvantage
 - Poor holding power characterized by accidental dislodgement from a vessel or structure
 - Foreign body and inflammatory reaction
 - Erosion into adjacent anatomic structures - pancreatitis and acute cholangitis from intraductal gallstone formation around a surgical clip
 - Significant interference with radiologic studies including computerized tomography and magnetic resonance imaging
- ▶ Metal Clip - 1908 yr first applied / Press origin
- ▶ Absorbable Polymer clip – 1982 yr first applied / lock origin

Clipping - skeletalization and exposure of the

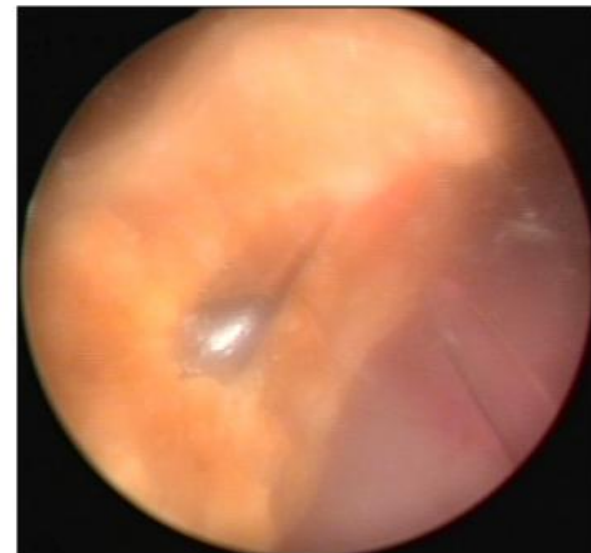
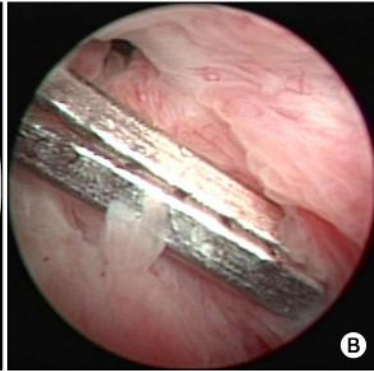
HEM-O-LOK BEHIND THE CLIP



Surgical Clip-Related Complications after Radical Prostatectomy

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Department of Urology, Seoul National University College of Medicine, Seoul, Korea



Case Report

Floating Hem-o-Lok Clips in the Bladder without Stone Formation after Robot-Assisted Laparoscopic Radical Prostatectomy

Yu Seob Shin, A Ram Doo¹, Jai Seong Cha, Myung Ki Kim, Young Beom Jeong, Hyung Jin Kim

Departments of Urology and ¹Anesthesiology, Chonbuk National University Medical School, Jeonju, Korea



Late-onset Hem-o-Lok® migration into the bladder after robot-assisted radical prostatectomy

Takehiro Ohyama,  Masaki Shimbo,  Fumiyasu Endo and Kazunori Hattori

Department of Urology, St. Luke's International Hospital, Tokyo, Japan

Case Report

Int Neurourol J 2013;17:90-92

<http://dx.doi.org/10.5213/inj.2013.17.2.90>

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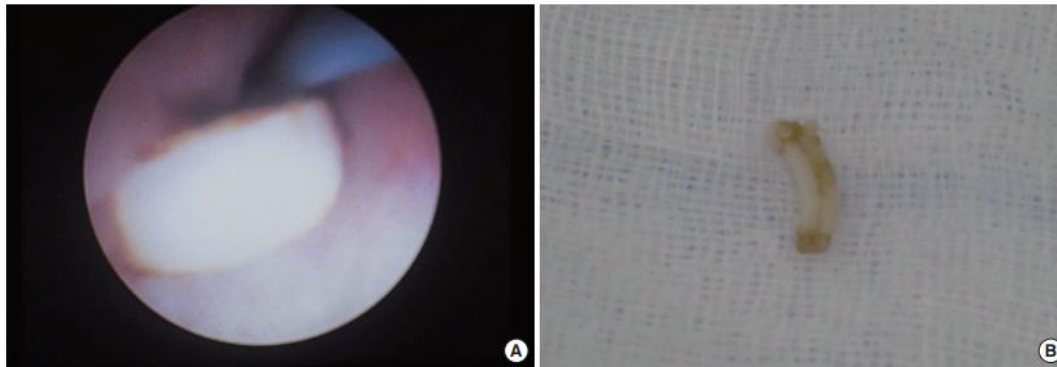
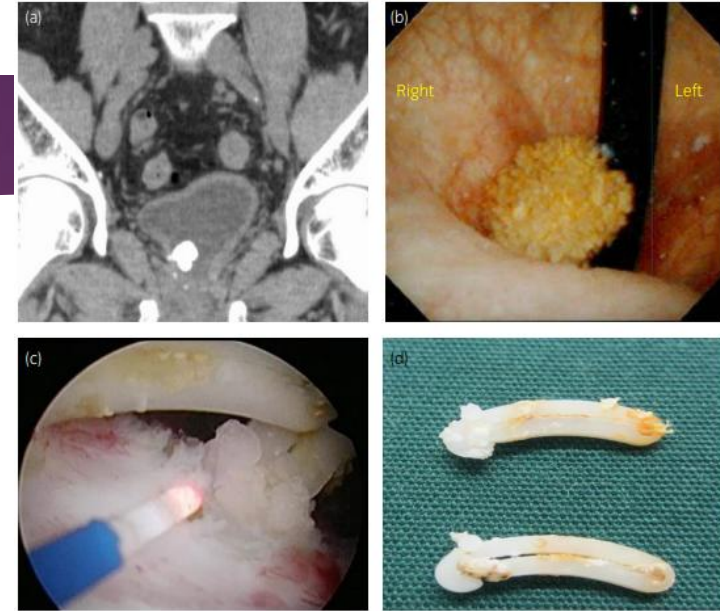
International Neurology Journal
INJ

Migration of a Hem-o-Lok Clip to the Ureter Following Laparoscopic Partial Nephrectomy Presenting With Lower Urinary Tract Symptoms

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¹Department of Urology, Gachon University Gil Medical Center, Gachon University of Medicine and Science, Incheon, Korea



Prevention ???

- ▶ First.....Not Clipping close to anastomosis site
- ▶ Second Using Early absorbable clips

ligation device – Endo gla

- ▶ Radical Nephrectomy - pedicle control
 - artery and vein : each
 - En bloc

- ▶ Radical prostatectomy – DVC control , but not doing recently

RENAL HILUM CONTROL

Renal vein ligation..

Various techniques for renal artery ligation

- Simple tie (single vs. multiple)
- Suture ligation
- Oversew
- Metal hemostatic clip (single vs. multiple)
- Locking hemostatic clip (single vs. multiple)
- Stapler (GIA vs. TA)

FDA WARNING !

- ▶ Vascular control
- ▶ FDA warning against use of Hem-o-lok clip
 - ▶ in living laparoscopic DN
- ▶ 6 deaths for 10 years
- ▶ attributed to the of Hem-o-lok clip

News > Medscape Medical News > Approved
Medscape Alerts

FDA Warns Against Certain Ligating Clips in Kidney Donors

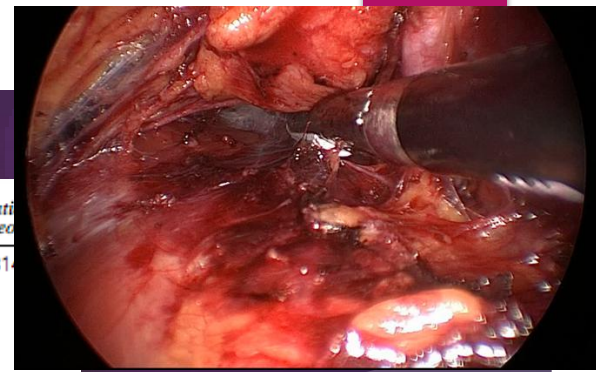
Lynne Peebles

[DISCLOSURES](#) | May 06, 2011



May 6, 2011 — Weck Hem-o-Lok Ligating Clips should not be used for renal artery ligation during laparoscopic living-donor nephrectomy, the US Food and Drug Administration (FDA) announced yesterday.

Despite the manufacturer, Teleflex Medical, adding the contraindication to the product's instructions for use in 2006, after 12 injuries and 3 deaths were attributed to the medical device during the preceding 5 years, the ligating clips continued to be employed for this indication. They have since been responsible for another 3 kidney donor deaths, prompting the FDA's



6)

Total (n = 149)

A

Technique

Transfixion

Suture ligature	3 (1–5)
Suture ligature + simple tie	4 (1–5)
Oversew	4 (1–5)
GIA™ surgical stapler	4 (1–5)
TA™ surgical stapler	4 (1–5)

Non-Transfixion

Single simple tie	1 (1–4)
Multiple simple ties	2 (1–5)
Single hemostatic clip	1 (1–3)
Multiple hemostatic clips	2 (1–5)
Single locking hemostatic clip	2 (1–4)
Multiple locking hemostatic clips	3 (1–5)

ment of choice for many
 renal disease (1). As the
 -stage renal disease is
 and for kidney donors is
 ney transplantation can
 shortage, and there
 ages associated with
 ,3,4). Furthermore, as
 taken, there is a general
 safe (5,6). Recent data
 live kidney donors at
 33%. One of the most
 g LDN is securing the
 varied vascular control
 to non-transfixion and
 ransfixion techniques,
 ound, but not through
 ies, the suture material
 ransfixing the staple or
 in. When transecting a
 chance of hemorrhage,

Still in real practice..

- ▶ Many surgeons do not use the vascular closing technique that they consider most safe.
- ▶ Failure of non-transfixion techniques is associated with greater risks for the donor.
- ▶ Control of major vessels in LDN must employ transfixion techniques for optimal donor safety

A	Total (n = 149)
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Oversew	4 (1-5)
GIA™ surgical stapler	4 (1-5)
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Non-Transfixion	
Single simple tie	1 (1-4)
Multiple simple ties	2 (1-5)
Single hemostatic clip	1 (1-3)
Multiple hemostatic clips	2 (1-5)
Single locking hemostatic clip	2 (1-4)
Multiple locking hemostatic clips	3 (1-5)

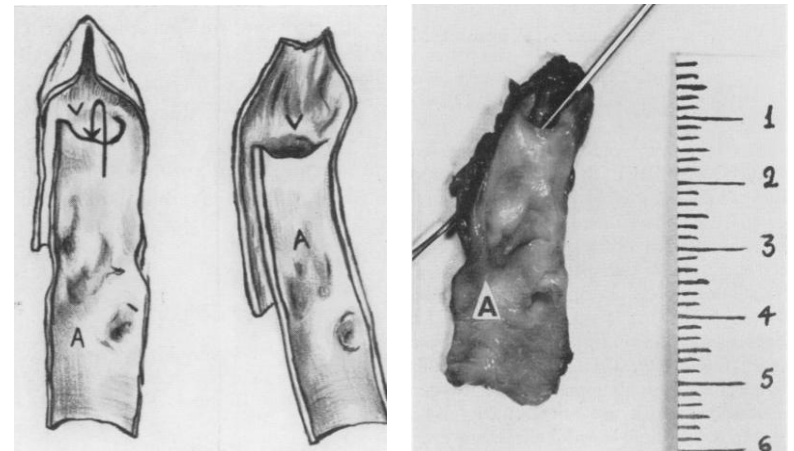
How about en bloc stapling ?

▶ **Benefits**

- ▶ More secure (transfixion)
- ▶ Faster (no need of separate ligation)
- ▶ Safer (less dissection, no bothering clips for stapling)
- ▶ Economic

En bloc ligation of renal hilum

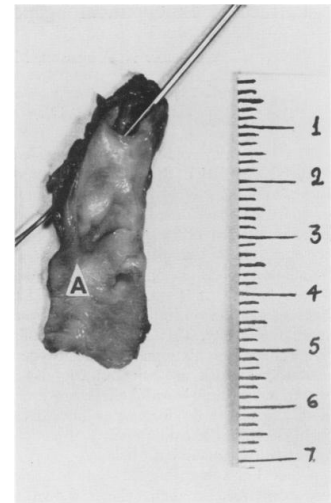
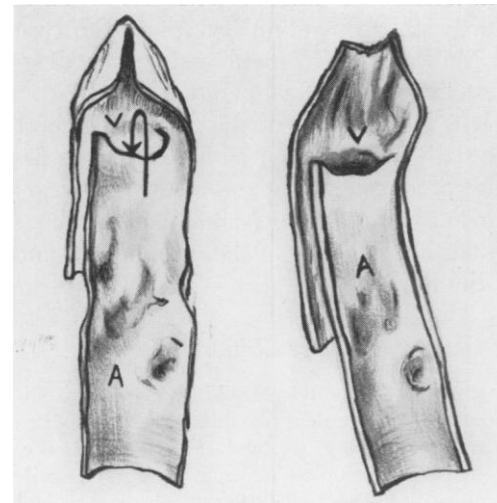
- ▶ Concern of **AV fistula**
 - ▶ First report in 1934 (Hollingsworth KW. *Am J Med Sci.*)
 - ▶ abdominal bruit, tachycardia and development of CHF
 - ▶ Very rare: less than 90 cases worldwide
 - ▶ Mostly after open en bloc ligation of the renal hilum in a patient with inflammation and adhesion



Concern of AV fistula

- ▶ Due to close proximity
 - ▶ Maybe associated with **silk sutures** which can act as a nidus for persistent bacteria seeding and inflammatory changes leading to **breakdown** at the site of sutured vascular stumps.

Kouba E, Smith AM. *Urology*. 2007;69:226-229.

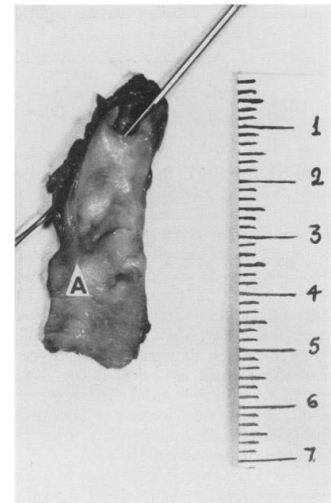
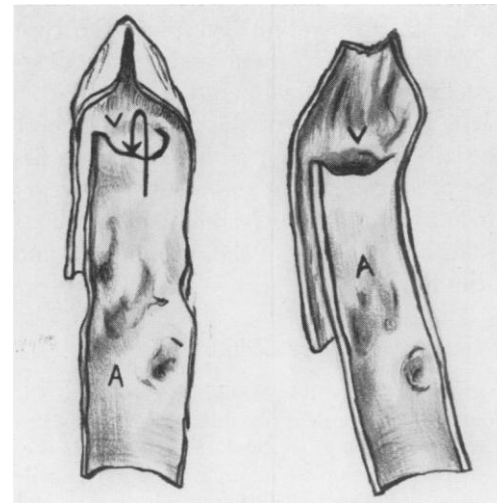


Concern of AV fistula

► Controversy

- AVF can form in the setting of **serial and separate vascular ligation** as well as from other **pathological processes**, including infection
- Mainly in the era predating staple ligation
- **Titanium staples** deployed by endovascular staplers have better **biocompatibility** and may be **less** prone to propagation of **infection or inflammatory reaction**

Scheidbach H, *Eur Surg Res.* 2004





Scientific article

Renal arteriovenous fistula following nephrectomy

Michel Lacombe M.D.

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[https://doi.org/10.1016/0090-4295\(85\)90554-0](https://doi.org/10.1016/0090-4295(85)90554-0)

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Abstract

Three cases of postnephrectomy renal arteriovenous fistula are described. A review of the literature shows the rarity of this complication since only 62 cases (including the author's cases) are known. Reported cases have been recognized after intervals up to forty years. The major complication is cardiac failure. Surgical treatment gives satisfactory results, but nonsurgical closure has now become possible. Early diagnosis is easy by auscultation of the loin which constantly reveals a continuous bruit.

- ▶ Review of 62 cases of postnephrectomy AVF formation from 1934 to 1985
- ▶ **only 12** were reported to have included en bloc ligation
- ▶ **Half of the 62 cases** were associated with postoperative infections, which represents a confounding risk factor for fistula formation.

Postnephrectomy Arteriovenous Fistula: *

Case Report and Review of Literature

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ROBERT H. SAGERMAN, M.D.,*** ELLIOTT S. HURWITT, M.D.

From the Divisions of Surgery and Diagnostic Radiology, Montefiore Hospital New York City, N. Y.

RENAL arteriovenous fistulas may be congenital, traumatic, neoplastic, or surgically induced. Twenty-seven of these have been reported,^{5, 14, 15} eight of which occurred subsequent to nephrectomy.^{2, 3, 6, 8, 10, 16, 18} The presently reported case is apparently the ninth, a very rare complication of a common surgical procedure.

sign was positive at 60 degrees on the right and was negative on the left. There was tenderness over the lower dorsal spine and the lumbosacral regions. Routine laboratory data were within normal limits. Roentgenograms of the chest and spine, upper gastro-intestinal series, barium enema, and cervical and lumbar myelography were not remarkable. Intravenous pyelography demonstrated absence of the right kidney and a normal left kidney. Bone survey revealed osteoarthritic

“post-nephrectomy infection and not en bloc ligation was the cause of AVF formation”



En bloc Stapling

Thwaini A et al. BJU Int. 2008
Aug;102(3):401

Laparoscopy and Robotics

En Bloc Stapling of the Renal Hilum During Laparoscopic Nephrectomy: A Double-institutional Analytical Study and Efficacy



Benjamin A. Sherer, Alexander K. Chow, Matthew J Sandip M. Prasad, and Kalyan C. Latchamsetty

OBJECTIVE To explore the safety and efficacy of en bloc laparoscopic nephrectomy (LNx) in a large double-institutional study.

METHODS We performed a retrospective review of patients operated on between 2004 and 2014 at 2 academic medical centers. Data analyzed included operative time, estimated blood loss, and perioperative complications. Arteriovenous fistula (AVF) formation was assessed. Postoperative diastolic hypertension, or new-onset diastolic hypertension, was also assessed.

RESULTS A total of 428 patients (mean age: 63 years) underwent laparoscopic nephrectomy with EBSH (226 left renal units, 202 right renal units). Mean operative time was 169 minutes (range: 51-489 minutes). Mean estimated blood loss was 155 mL (range: 0-2000 mL). Mean tumor size was 5.6 cm (range: 1.5-12.5 cm). No patients with chronic infectious and inflammatory diseases received post-procedural imaging. No patients had AVF at a mean follow-up of 51 months.

Operative Outcomes

Mean operative time	169 min
Estimated blood loss	155 cc (50-2000)
Conversion to open	1 enterotomy
	1 vena cavotomy
	1 splenic laceration
	1 prolonged hypotension
	1 extraction of renal mass
	1 bleeding lower pole vessel
	1/428 (0.2%)
Stapler-related complication during EBSH	
Follow-up	
Median	32 mo
Mean	51 mo
Range	12-112 mo
Average postoperative diastolic blood pressure	71.9 (54-96)
Postoperative imaging	
A/P CT with IV contrast	300/428
A/P CT without IV contrast	128
Retroperitoneal ultrasound	92
MRI with gadolinium	58
Evidence of AVF	18
	0/300

A/P, abdominal/pelvic; AVF, arteriovenous fistula; CT, computed tomography; EBSH, en bloc stapling of the renal hilum; IV, intravenous; MRI, magnetic resonance imaging.

Meta Analysis (2017)

Trauma/Reconstruction/Diversion

Safety and Efficacy of En Bloc Renal Hilar Vascular Staple Ligation: A Meta-Analysis



Win Shun Lai and Soroush Rais-Bahrami*

From the Departments of Urology (WSL, SR-B) and Radiology (SR-B), University of Alabama at Birmingham, Birmingham, Alabama

Purpose: We reviewed the literature on the safety of en bloc ligation. We also performed a meta-analysis of the effect of using this technique with vascular staplers on perioperative factors compared to conventional renal pedicle dissection and isolated staple ligation of the renal artery and vein.

Materials and Methods: A literature search was performed to include all primary studies related to the safety of en bloc ligation of the renal hilum. After exclusion criteria were applied 9 studies were identified for review, of which 4 included a control group and were used in the meta-analysis. The primary end point was the incidence of arteriovenous fistula. Secondary end points were procedure duration, blood loss and the number of perioperative complications.

Results: None of the total population of 595 patients in whom en bloc ligation was performed for nephrectomy were diagnosed with arteriovenous fistula formation at an average postoperative followup of 26.5 months. When comparing en bloc and isolated ligation of the renal artery and vein, the meta-analysis showed a significant improvement in procedure duration for en bloc nephrectomy. There was no difference in estimated blood loss or the number of complications.

Conclusion: En bloc ligation appears to be as safe as and potentially more beneficial in terms of perioperative factors than conventional renal pedicle

Abbreviations and Acronyms

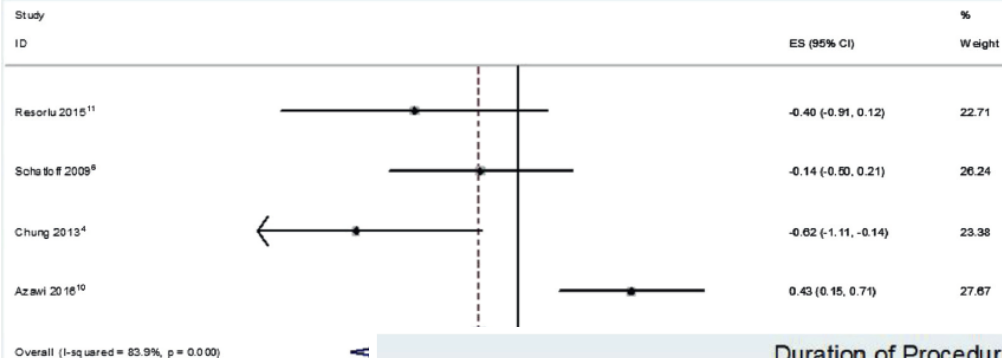
AVF = arteriovenous fistula
CHF = congestive heart failure
EBL = estimated blood loss
SMD = standard mean difference

Accepted for publication July 12, 2016.

No direct or indirect commercial incentive associated with publishing this article.

The corresponding author certifies that, when applicable, a statement(s) has been included in the manuscript documenting institutional review board, ethics committee or ethical review board study approval; principles of Helsinki Declaration were followed in lieu of formal ethics committee approval; institutional animal care and use committee approval; all human subjects provided written informed consent with guarantees of confidentiality; IRB approved protocol number; animal approved project number.

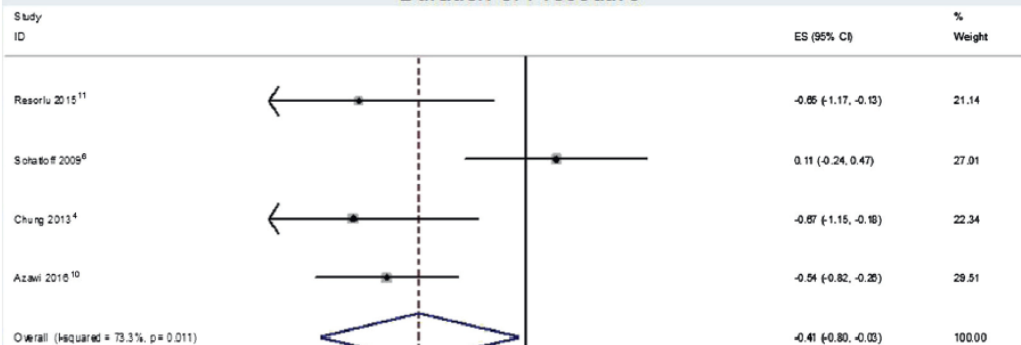
Estimated Blood Loss



Note: Weights are from random effects analysis
Vertical dotted line refers to overall effect size

-1

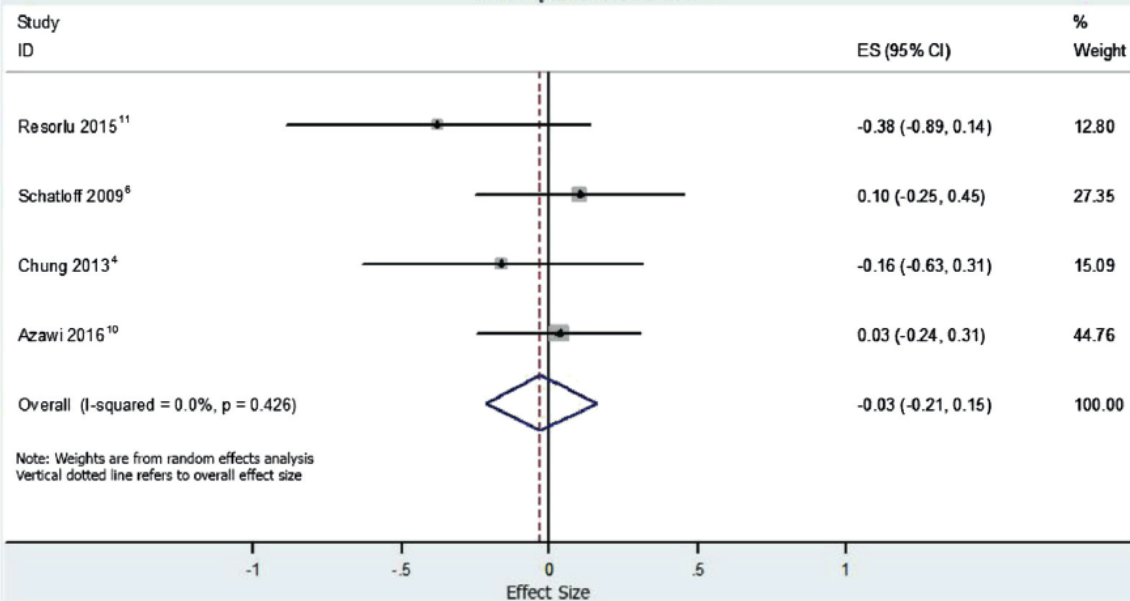
Duration of Procedure



Note: Weights are from random effects analysis
Vertical dotted line refers to overall effect size

-1

Complication Rate



Note: Weights are from random effects analysis
Vertical dotted line refers to overall effect size

Meta Analysis (2017)

▶ Conclusion

- ▶ En bloc ligation has historically been associated with AVF formation in the renal pedicle stump.
- ▶ However, in **the last 20 years** several studies of outcomes in almost **600 patients** did **not show a single patient with AVF** on postoperative followup.
- ▶ Moreover, based on our meta-analysis en bloc ligation could decrease **operative time**. Therefore, en bloc ligation appears to be as safe as and potentially more time saving than the conventional isolated vascular ligation approach.

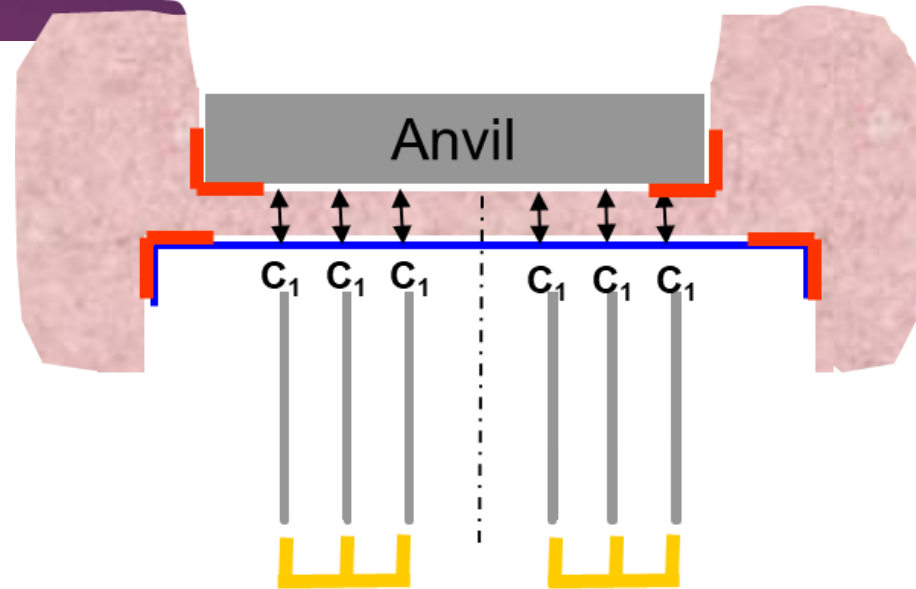
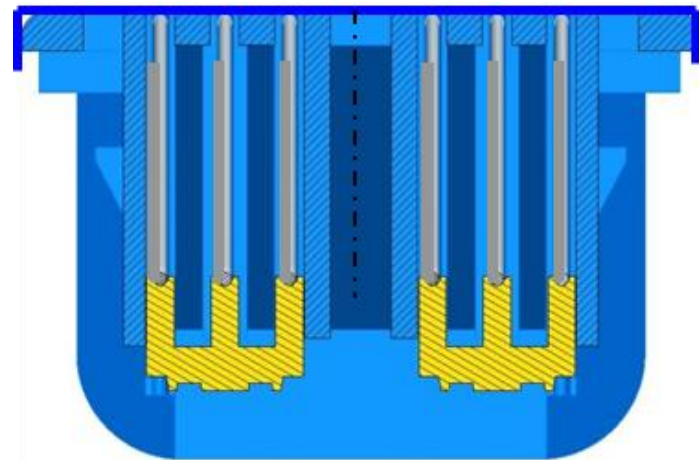
J Urol 2017 Jan;197(1):175-181 Lai WS et al.

Stapler: concerns

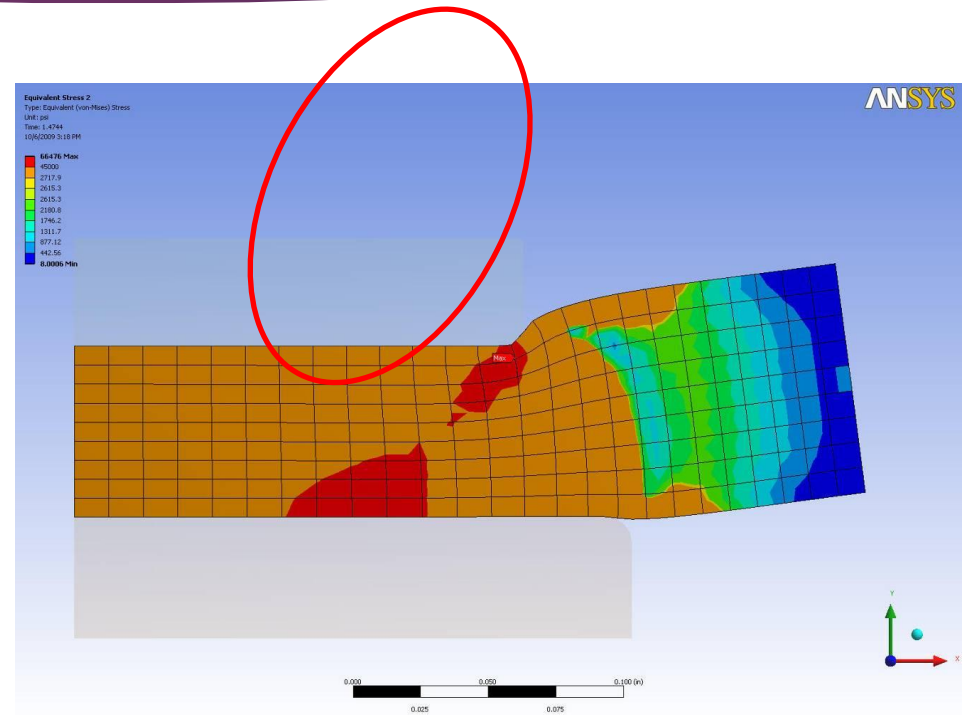
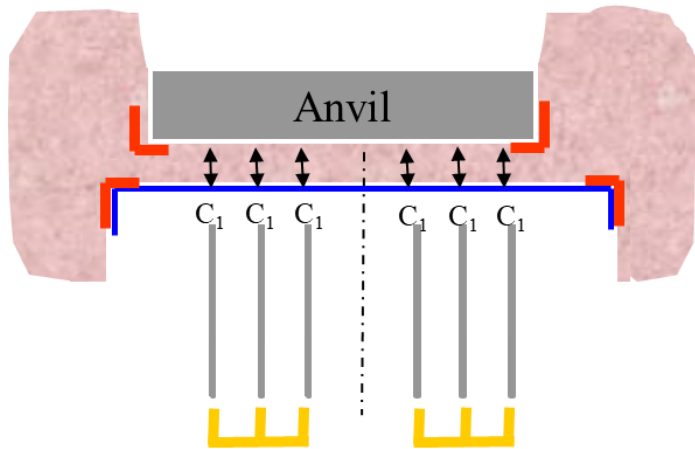
- ▶ Tissue damage
 - ▶ Crushing injury
 - ▶ Ischemia
- ▶ Bleeding
 - ▶ Less secure than clip of tie ?
- ▶ Device malfunction

Stapler: conventional

Anvil



Stapler: tissue effects



Stress concentration location for Universal reload



경청해 주셔서 감사합니다.