Management of Malignant Ascites

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Objectives

- Describe the pathophysiology and diagnoses of malignant ascites
- Recognize the symptoms affecting quality of life related to recurrent ascites, and the impact on patients and caregivers
- List the possible management options for malignant ascites including advantages and drawbacks of each
- Describe the placement and use of tunneled peritoneal catheters and other devices used in palliative treatment of recurrent ascites

The problem….

Ascites Definition

The accumulation of serous fluid in the peritioneal cavity, causing abdominal swelling

Origin: 1350-1400; Late middle English *aschites* : via late Latin from Greek *askites(hydrops)* abdominal (dropsy) equiv. to *ask(os)bag; belly + -ites, 'wineskin'*

Dictionary.com Unabridged 2010

Ascites [əsī′tēz] Etymology: Gk, *askos, bag*

An **abnormal intraperitoneal accumulation of a fluid containing large amounts of protein and electrolytes.** Ascites may be detectable when more than 500 mL of fluid has accumulated. The condition may be accompanied by general abdominal swelling, hemodilution, edema, or a decrease in urinary output. Identification of ascites is made through palpation, percussion, and auscultation. Ascites is **a complication**, for example, of cirrhosis, congestive heart failure, nephrosis, malignant neoplastic disease, peritonitis, or various fungal and parasitic diseases.

Etiologies of All Ascites

75% Cirrhosis (transudative)

10% Malignant (exudative)

3% Cardiac Failure

2% TB

10% Other

Reynolds TB, Ascites Clin Liver Dis 2000;4:157-68

Pathophysiology of Ascites in Cirrhosis

- Increased hepatic resistance to portal flow
  - portal HTN
  - collateral vein formation (varices)
  - shunting blood to systemic circulation

- Splanich vasodilation
  - decrease in arterial blood vol,
  - decrease in arterial BP
  - vasoconstriction, sodium and fluid retention

- Portal HTN and splanich vasoconstriction alter intestinal capillary pressure and permeability which produces ascites

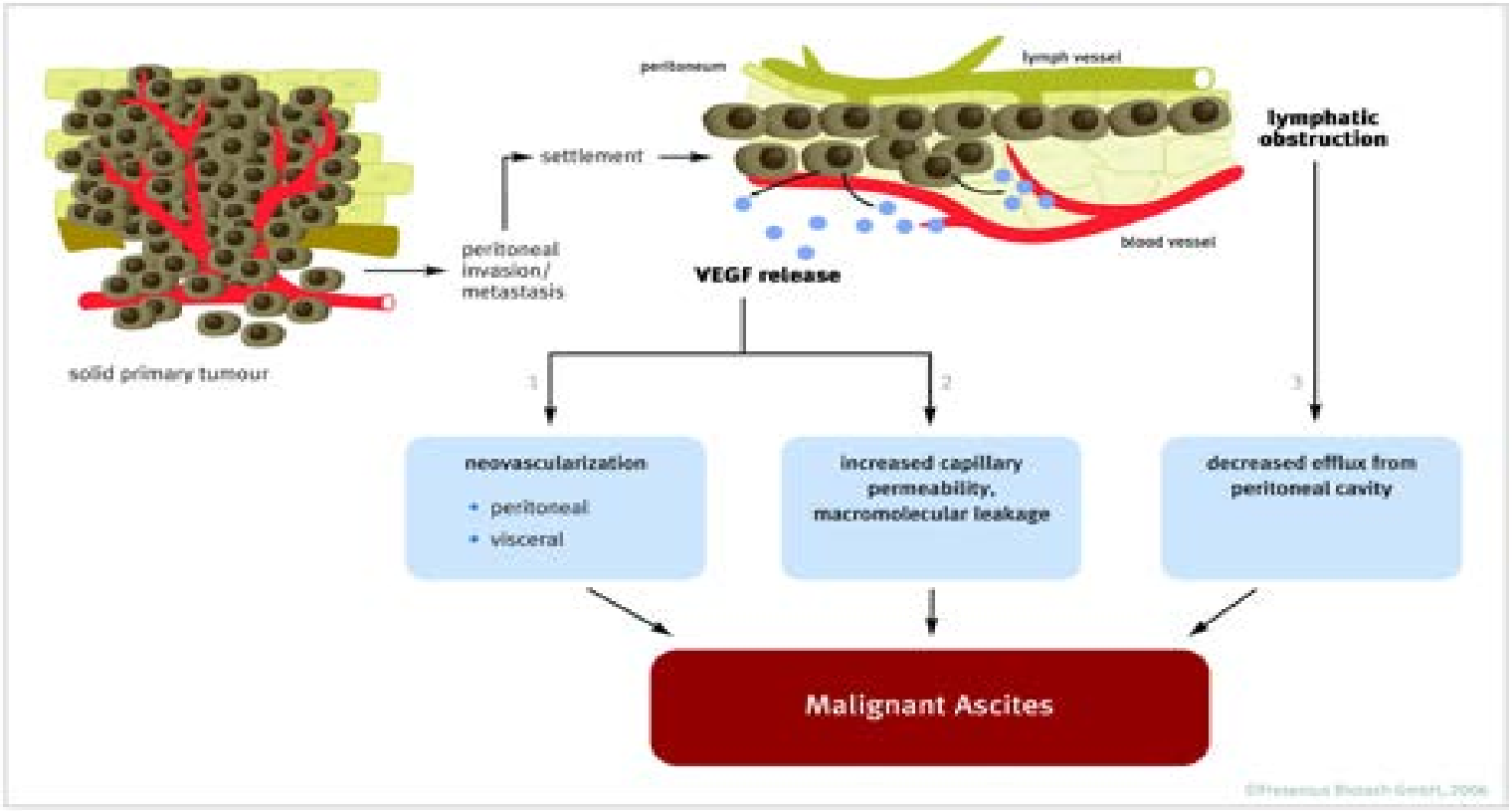
- Renal vasoconstriction and impaired free water excretion leads to hyponatremia and hepatorenal syndrome

Causes of Malignant Ascites

- Peritoneal carcinomatosis - (parietal or visceral invasion)
- Obstruction of lymph drainage or lymphatic invasion
- Hepatic congestion due to tumor infiltration
- Vascular permeabiity changes
- Exudate of protein from tumor cells
- Obstruction of venous drainage

Brooks RA, Herzog TJ Gyn Oncology 101(2006)360-362

Malignant Ascites Etiology



Serum-Ascites Albumin Gradient (SAAG)

High SAAG >1.1

(Transudate)

- Cirrhosis
- Heart failure
- Hepatic Venous Occlusion,(vod, Budd-Chiari)
- Constrictive pericarditis
- Kwashiorkor

Low SAAG <1.1

(Exudate)

- Malignancy
- SBP, Infection
- Pancreatitis
- Nephrotic Syndrome
- Hereditary Angioedema

Malignant Ascites

Diagnoses:

- Positive cytology
- LDH > 250 mcg/ml
- Chol > 70 mg/dl
- SAAG <1 g/dl
- pH<7.30
- Protein >30 gm/L
- wbc elevated

Impact on Quality-of-Life

Mass effect causes:

- Painful abdominal distention
- Early satiety
- Anorexia
- Nausea
- Vomiting secondary to ext. compression of stomach or bowel
- Shortness of breath
- Limited mobility
- Lower extremity edema
- Clothing issues

Rosenberg, S , Gastroenterology Clinics of North America March 2006 vol 35

Malignant Ascites

- Poor prognosis
- Mean survival after initial paracentesis:
  1 to 4 months
- Ovarian cancer, median survival:
  > 300 days (10 mos)

Parsons SC, et al Eur J. Surg Oncol 1996;22:237-9

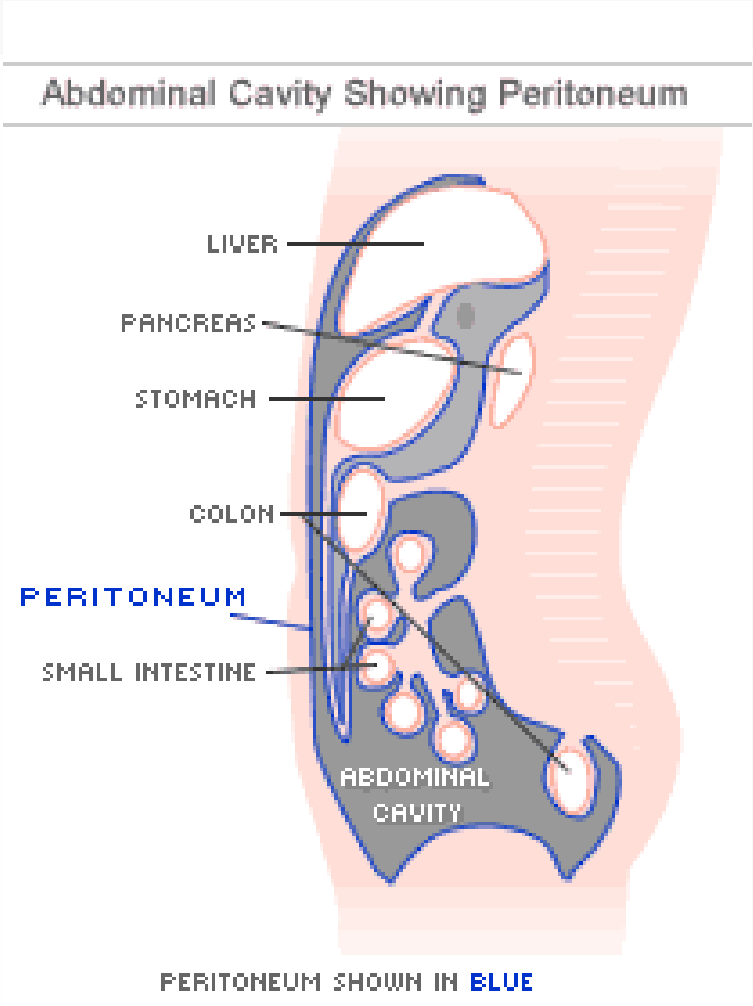
Malignant Ascites - origins

Cancers of:

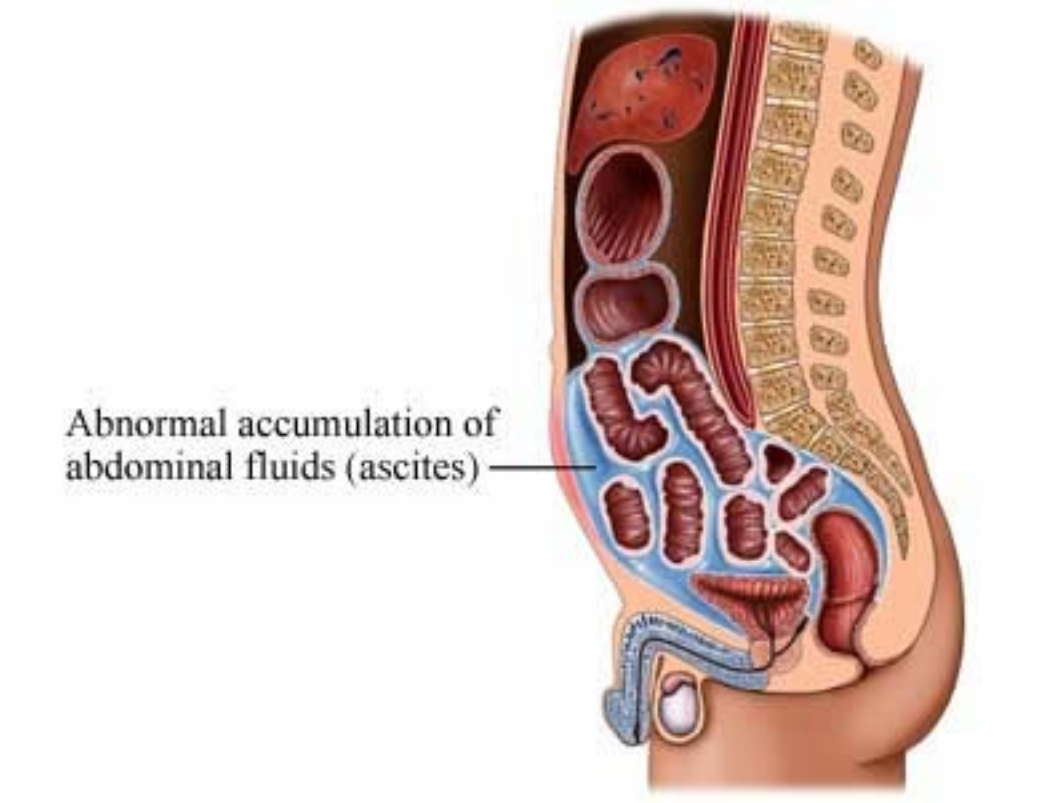
- Breast
- Ovarian
- Colon
- GI tract
- Endometrium
- Mesothelioma
- Melanoma

20% unknown

Anatomy Abdominal Cavity



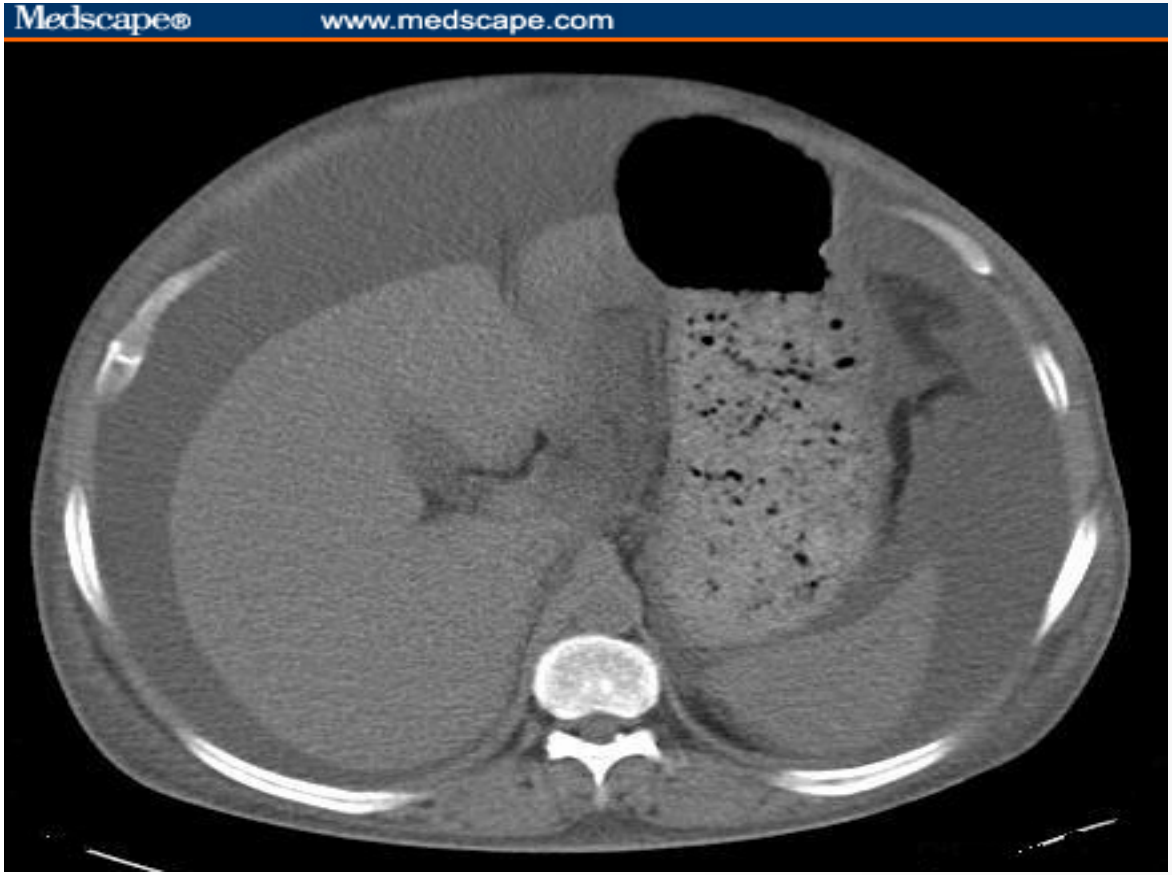
Ascites: anatomy



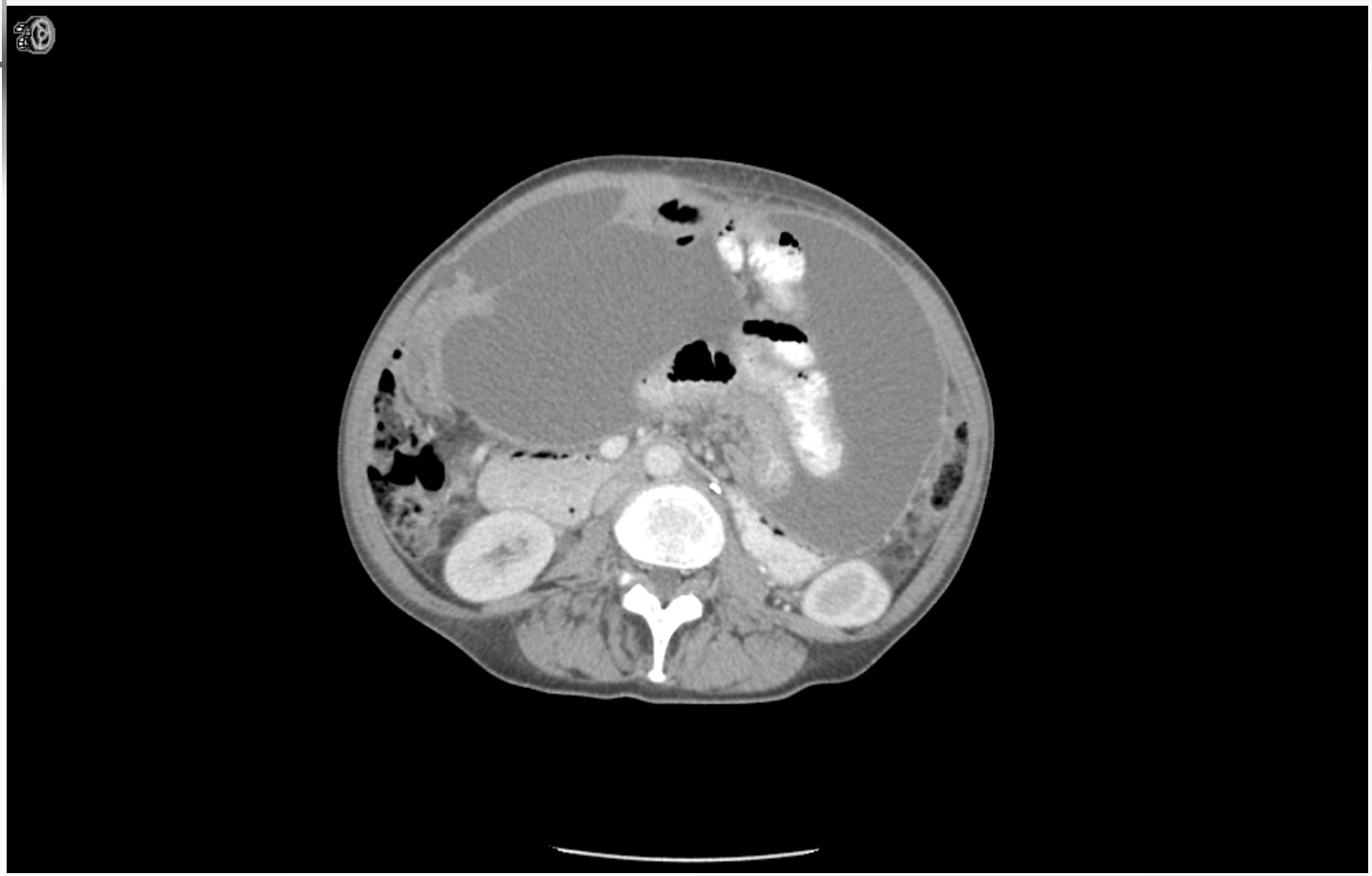
Ascites

Ascites on ultrasound

MASSIVE ASCITES



LOCULATED ASCITES



The goal…

- Easier drainages
- Eliminate trips to hospital
- Improve Q-O-L

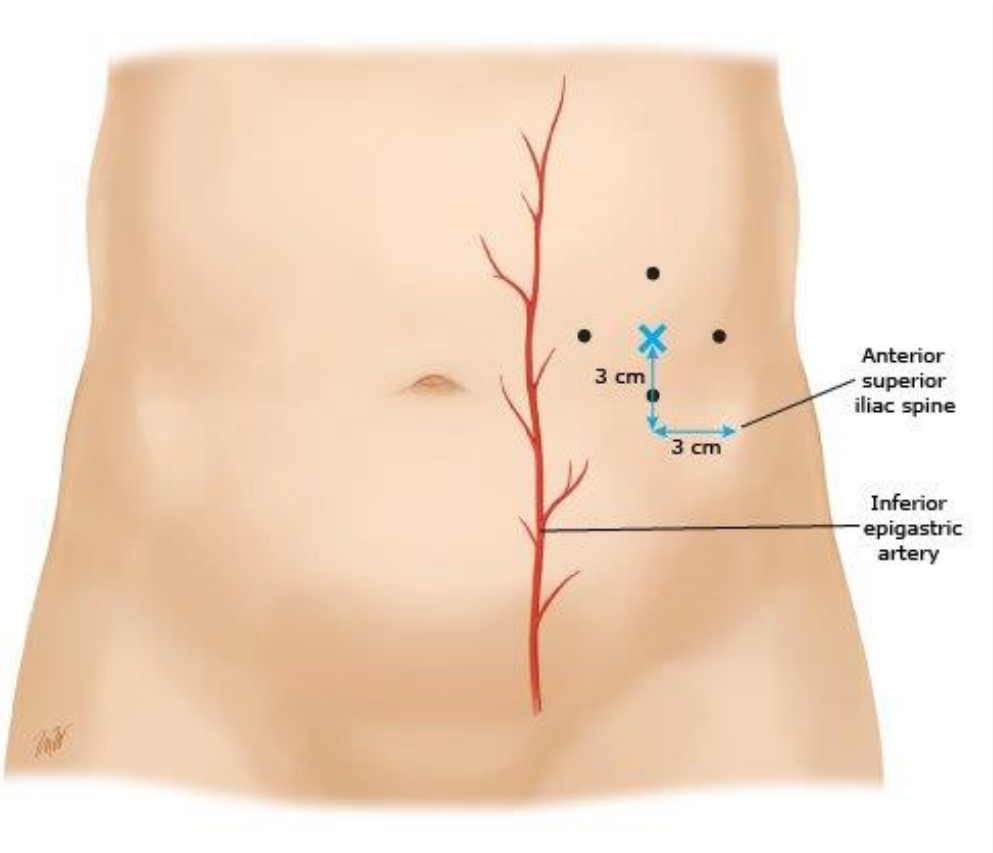
Options for Ascites Treatment

- Medical management: fluid restriction, diuretics, sodium restricted diet
- Conventional paracentesis
- Passive non-tunneled catheters
- Peritoneo-venous shunts
- Tunneled, cuffed, catheters
- Peritoneal port-a-caths

Conventional Paracentesis

- Most common option
- Safe (1% major complication rate)
- Immediate relief
- Bedside procedure or U/S guided
- May be considered “bridge” to resolution of ascites production

Paracentesis potential access locations



Problems with Paracentesis

- Frequent hospital visits
- Loss of work for family/caregivers
- Risk of intrabdominal organ injury
- Infection
- Painful

SBP - Peritonitis

A risk whenever ascites is present

- 10-30% - prevalence in cirrhotic patients admitted to hospital
  Rimola A et al J. Heptol 2000; 32: 142-53
- 8-10% - prevalence with cirrhotic ascites, rare with malignant
  Kurtz RC, Bronzo RL AmK Gastroenterol 1982;77:146-148
- 3.5% - prevalence in outpt with cirrhotic ascites, absolute neutrophil >/= 250 cells/mm3
  Evans LT et al Hepatology 2003 Apr;37(4):897-901

Peritonitis

- Diagnoses: 250 PMN/ml3 fluid
- Translocation of bacteria from intestine to lymph nodes can lead to bacteremia; E.Coli or Gram pos
- Can be complicated by hepatorenal syndrome (30%)
- 70% probability of recurrence in 1 yr
- Treated with 3rd generation cephalosporin
- Pain, fever, diarrhea, encephalopathy
- Asymptomatic
- Cultures may be negative
- SAAG low

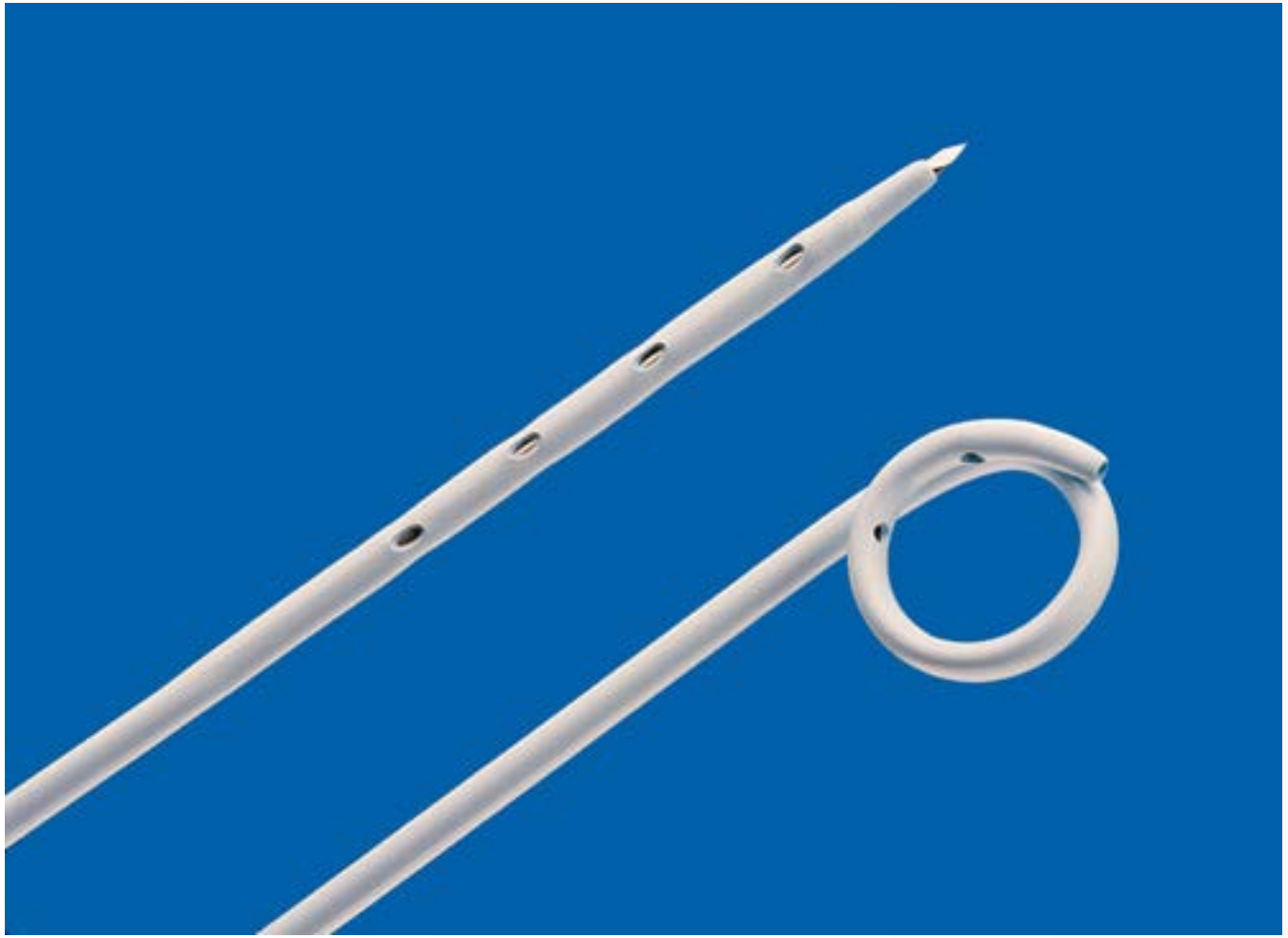
Tito L, et al Hepatology, 1988;8:22-31

Non-Tunneled Catheters

- Passive drainage into bag
- “Pig tail” catheters placed under U/S or CT
- Minimally invasive
- 35% complication rate: peritonitis, accidental removal, leakage, occlusion of catheter
- Consider in patients with very short life expectancy

Lee A, Lau TN Indwelling catheters for the management of malignant ascites. Support Care Cancer 2000;8:493-9.

“pigtail” catheter



Non-tunneled “peritoneal catheter”

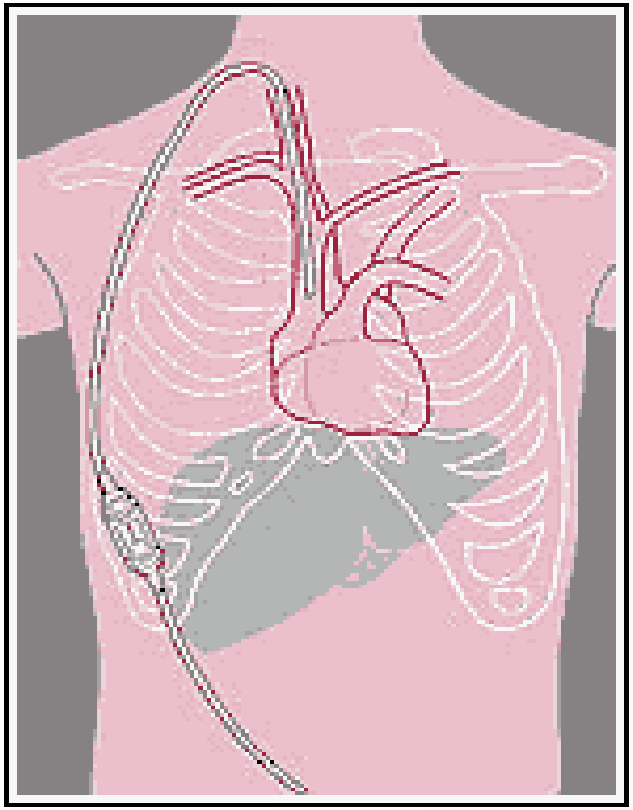
- 40 pt advanced malignancies, Italy 2008
- Admitted 2-14 d
- 34 went home
- Drained during admission 800cc -20L
- No infection
- 22 improved, 10 no change in symptoms or worse
- 1/3 mechanical problems
- 6 died

Mercadante S et al . Support Care Cancer. 2008;16(8):975-8

Peritineo-venous Shunts

- Le Veen Shunt – Developed 1974 for continuous drainage of ascites into the systemic circulation
- Denver Shunt (Denver Biomedical, Cardinal Health, CareFusion)
- 1980s Surgical procedure with general anesthesia, large venous cutdown 2-3 days in hospital
- Now can be percutaneous, under conscious sedation
- Peritoneo-gastric, peritoneo-urinary shunts have been used

Peritineo-venous Shunt



Peritoneo-Venous Shunts: “Beneficial Effects”

- Increased cardiac output
- Increased renal blood flow
- Increased GFR
- Increased sodium excretion
- Decrease in plasma renin activity and aldosterone
- Can improve short term survival

Seike M et al J Gastroenterol Hepatol. Dec 2007;22(12):2161-6

Peritoneo-venous Shunts Problems

- Prone to occlusions, requiring revisions/replacement
- Associated with pulmonary edema
- May cause thromboses of major central vein or SVC
- DIC
- Spread malignant cells throughout the body
- Several days in hospital after placement
- May need to pump 20x, twice a day
- Significant mortality related to procedure,8%; 43% 30 day

Peritoneo-venous Shunts
Why would you do it?

- 43% 30 day mortality
- 8 % Procedure related mortality
- 15% Device failure
- 15% Required revision

Hussain PF et al Cardiovasc Interventional Rad 2004 Jul-Aug;27(4):325-8

"Modern" PVS, Japan 2005

1994-2005, 126 pt: 93 cirrhosis, 17 cancer, 16 chylous

Absolute Contraindications: heart failure, resp failure, jaundice with t bili >10, peritonitis, DIC, untreated esoph varices, active GI bleed, severe peritoneal adhesions..
Complications when **plt <60** k at time of op, 46% of compl occurred 1 wk post-op

Usual complications- higher rate in cirrhosis, most died 6 mos liver failure.
Shunt **obstruction** 26% in chylous, 13% in cirrhosis, 12% cancer
Central line, foley, abdominal binder
DIC "almost inevitable" in cirrhosis- give "anti-DIC injection"

Results: shorten LOS, reduce blood products, decrease treatment costs

...makes it possible for even an internist to perform shunt surgery of the peritoneal cavity and subclavian vein relatively easy"

Indication and Practice of Denver Shunt for Refractory Asscites, Kan Tan Sui, vol 50, No.5 (2005)pp.775-781

Peritoneo-venous Shunts

2008 report, 55 Pts, percutaneous placement

Technically feasible and effective

- 36 cirrhosis/17 malignant/1 PCK cyst rupture
- 2-3 days in hospital
- F/U 2-1620 days
- 15% mortality - DIC, esophageal variceal bleed, sepsis
- No difference shunt patency malignant vs non-malignant ascites
- 27% complications - DIC, bleed, leakage, pain, infection, venous thrombosis, PE
- Occlusions 16%

Jong Yun Won et al , J Vasc Interv Radiol 2008;19:1717-1722

“Modern” PV shunts

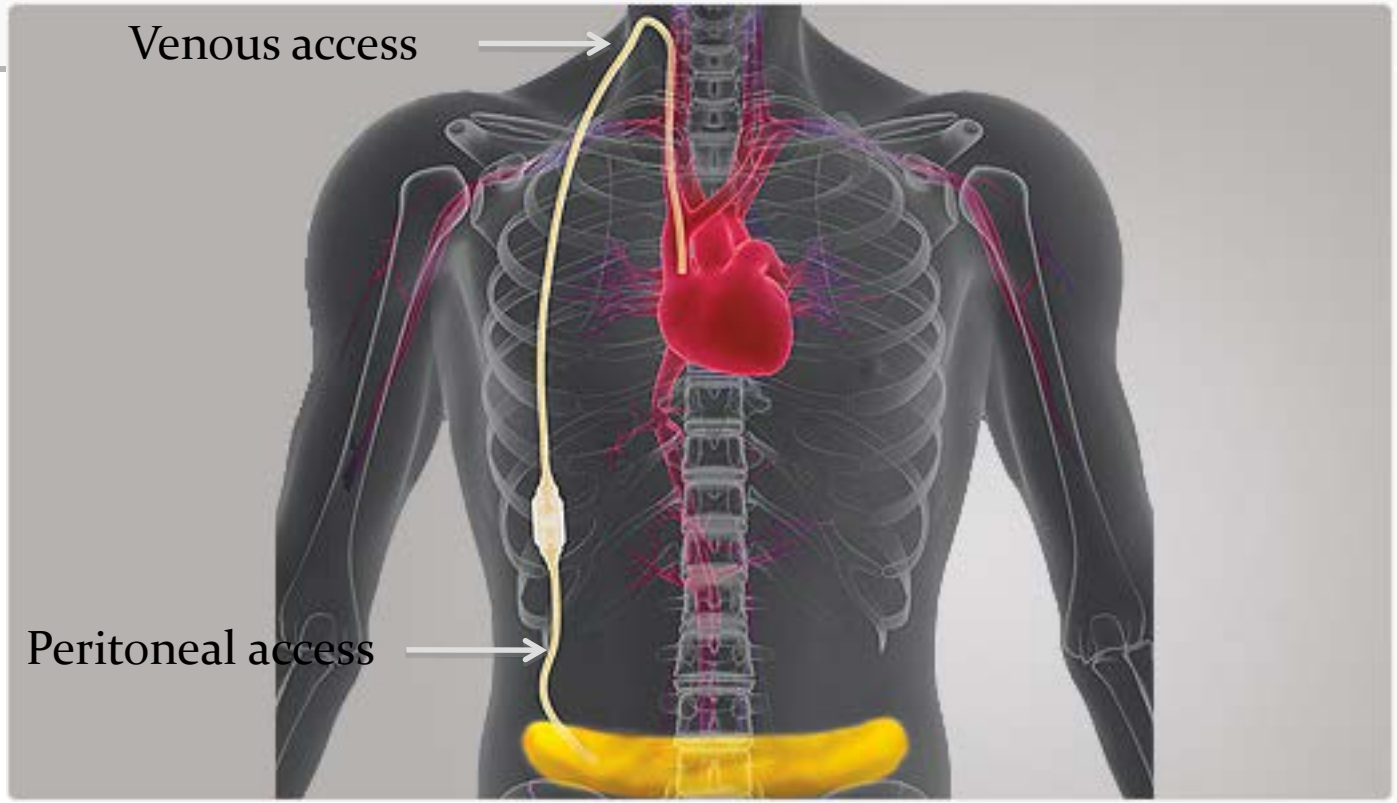
The Denver ascites shunt from CareFusion is designed to give you and your patients an alternative to conventional therapy in managing retractable ascites. The Denver ascites shunt is a peritoneo-venous shunting system that can help relieve symptoms of ascitic fluid buildup. The ascites shunt can provide **physiologic benefits**, including increased effective blood volume, renal blood flow and diuresis, retained nutrients and **improved nutritional status, improved mobility and respiration** and relief of massive, refractory ascites. The Denver ascites shunt **can be placed percutaneously via internal jugular vein.**

www.Carefusion.com Denver Shunt Brochure

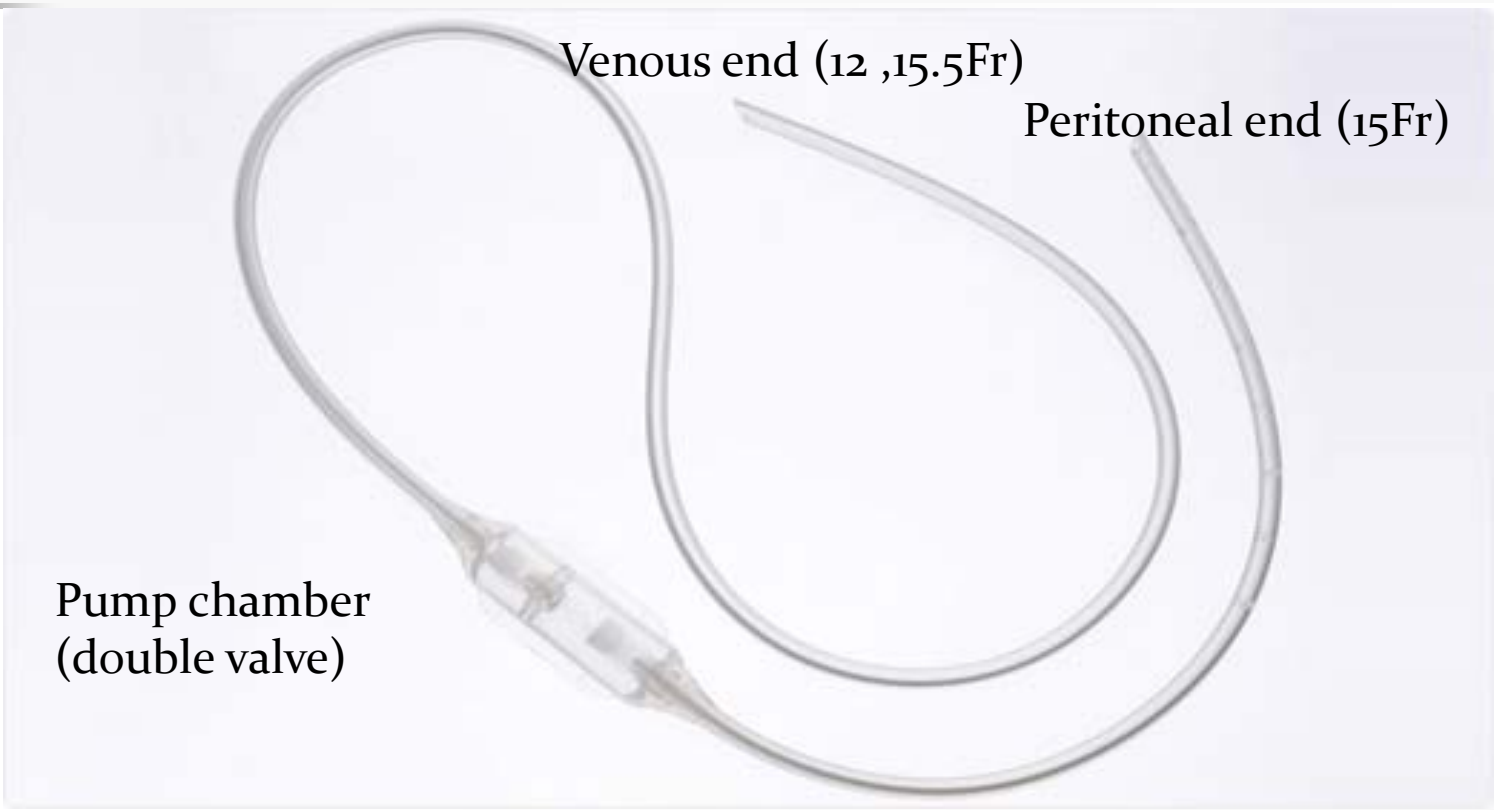
“Modern” PV Shunting Considerations for reduced complications

- Drainage of as much ascites as possible before shunt placement.
- Exclude patients with history of esophageal variceal bleeding.
- Percutaneous technique
- Avoid use of subclavian vein
- Venous end size selection (12Fr vs 15.5)
- Single vs Double valved pump chamber

Denver Shunt



Denver Shunt



“Improved”Denver Shunt

Silique™ surface treatment
Denver shunts now include the Silique surface treament, which enhances the properties of our silicone shunts:

- Smoother, more uniform surface
- Less tacky
- Lower coefficient of friction

This is the same type of surface treatment used on devices such as infusion ports, central venous catheters, I.V. catheters and hemodialysis products.

Making case the for PVS

"Percutaneous placement of peritoneovenous shunt is a **safe, fast and inexpensive procedure,** extremely useful in resolution of refractory ascites, reducing symptoms and allowing effective palliation with **a great improvement in quality of life." 1**

European Radiology, 2002

"Our results suggest that peritoneovenous shunting might be beneficial in patients with refractory ascites **waiting for liver transplant and could prevent postoperative acute renal failure.**" 2

American Journal of Transplantation, 2005

"Peritoneovenous shunt placement provides an **effective treatment option** for patients with refractory **malignant ascites** in advanced cancer, and yields a higher likelihood of discharge **compared with** conventional **paracentesis."** 3

Journal of Gastroenterology and Hepatology, 2007

PV Shunts in USA

Hundreds of cases past ~4 years
Safe, feasible, effective

Dr. George Gertajdam
Sloan Kettering, NY
SIR 2011 Annual Meeting

Dr. Michael Soulen
Hospital of University of Pennsylvania
SIR Annual meeting

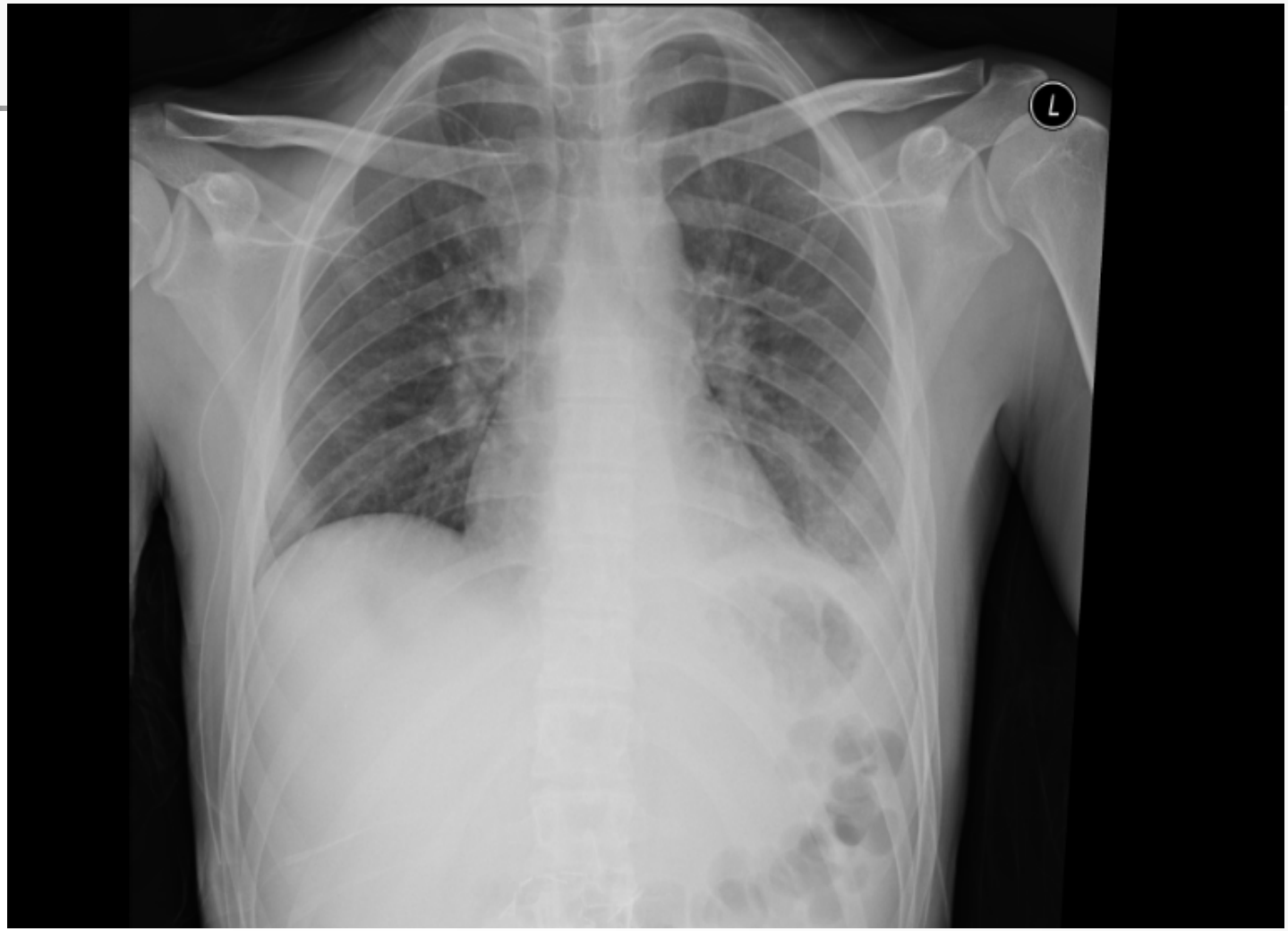
Dr. S. William Stavropoulos
Hospital of University of Pennsylvania
4th Annual Symposium on Clinical Interventional Oncology,
Jan 15, 2012, Miami Beach

1st BWH PVS Placement 7/05/2012

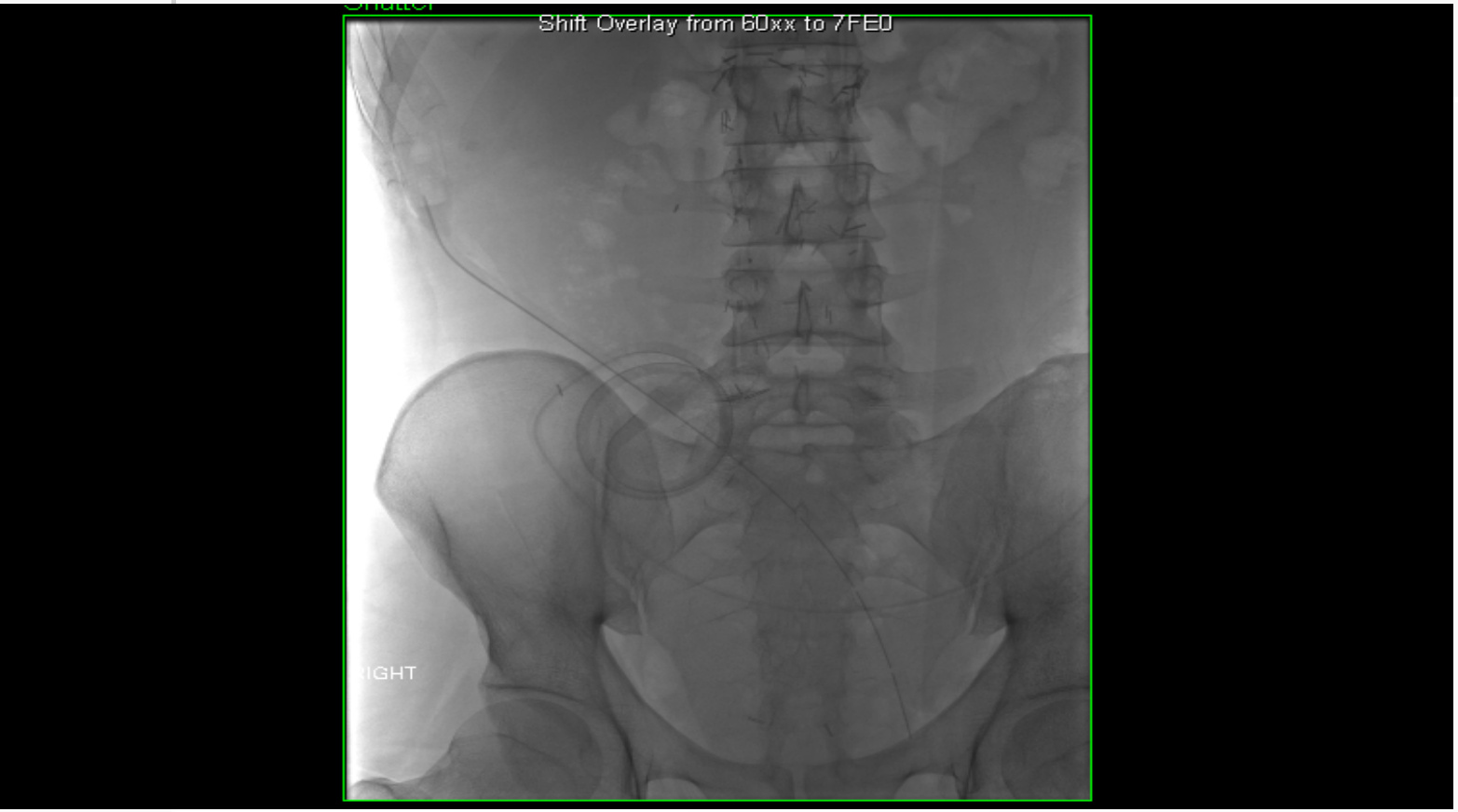
- 23 yo with advanced germ cell testicular cancer.
- Presented w 2 months back pain, hemoptysis 2010
- RP mass, IVC involvement, mult lung nodules, mediastinal LAN
- 10/4/2011 Chemo, RT orchiectomy
- 3/22-3/28 Laparotomy, retroperitoneal lymph node dissection
- Abdominal pain, distention, 15 lb wt gain, CT 4/26 new ascites, Chylous
- Admited 6/1-6/11/12, PleurX 6/5, TPN, opiates
- PleurX 6/5/12 (GA because of opiate requirements)
- Draining 2 liters per day.
- Readmit 6/24-7/11, t 103, GPC blood, resolved, starving
- No recurrent disease by lab makers
- PVS 7/5/12 (GA)

Chylous Ascites

Venous end PVS



Peritoneal end PVS



POD #4

Looks great!
Eating well!
Pain controlled with adjusted methadone dose
Patient able to pump twice a day.

POD #6 Going Home

11/8/12 Ready for removal, Albumin 4.5, gained weight

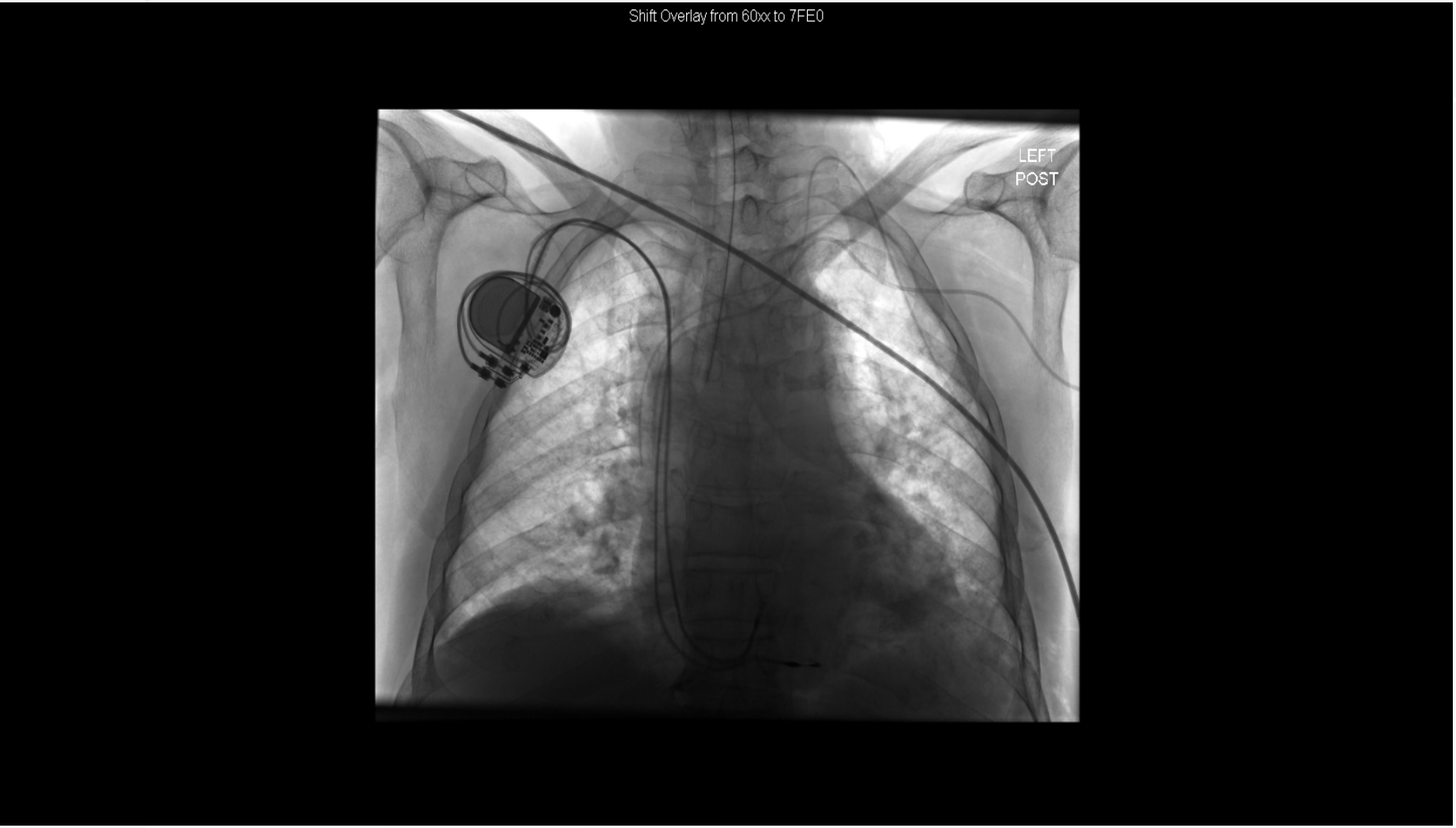
Shunt removed 11/8/12

2nd pt 10/20/2013

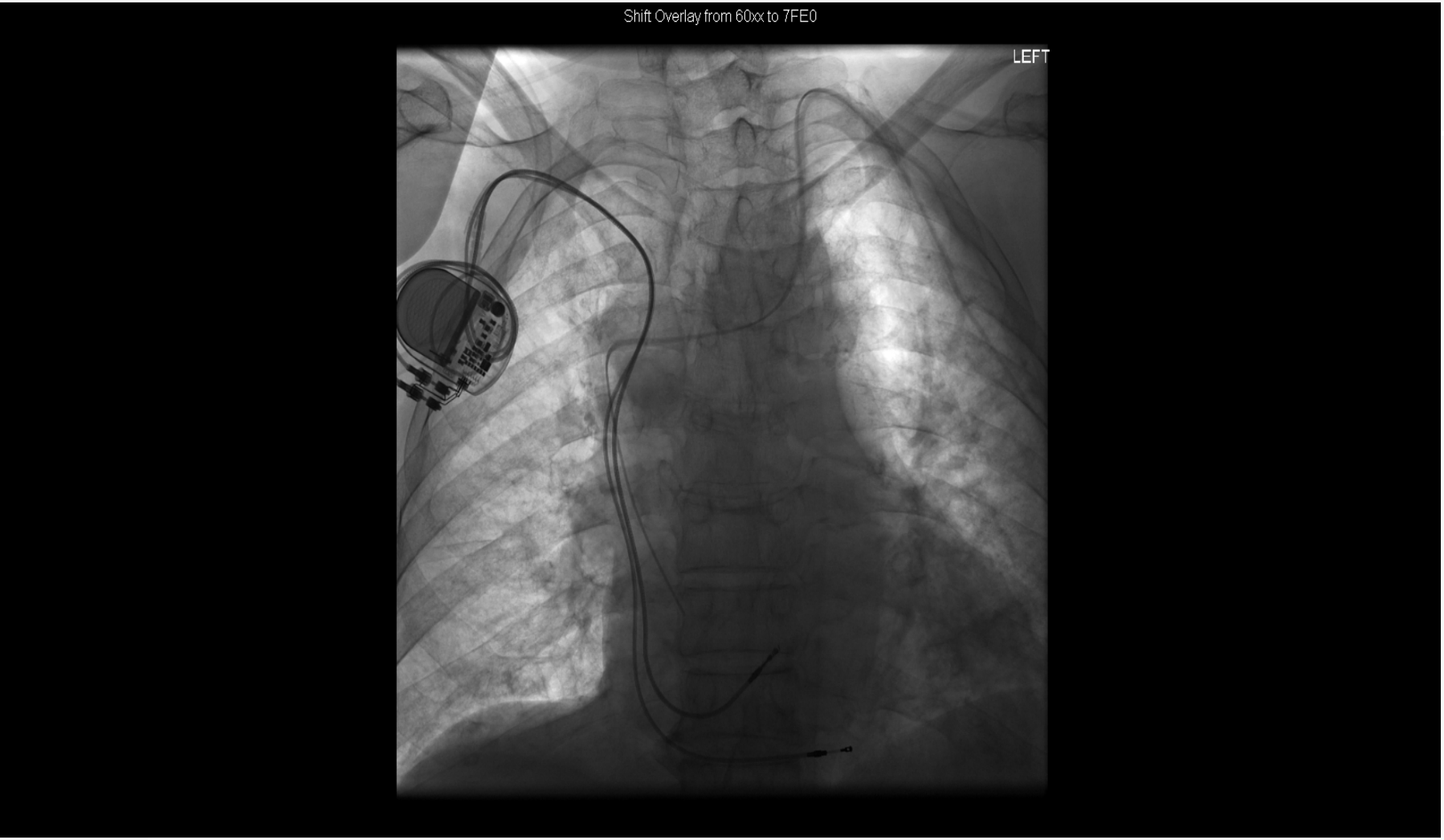
- 77yo m Portugese speaking urothelial cancer of bladder/left kidney
- 6/28/13: robot assisted Left nephrouretectomy
- Chylous ascites
- Multiple paras starting 8/13: 4-5 liters
- TPN x ~3weeks, via Left PICC
- Right sided pacemaker

Peritoneal end

Venous end



Revised b/c fibrin sheath 2/11/14



Follow-up?

- 1/24/14 cysto TURB, carcinoma in situ
- 7/8/14 Surveillance cystos
- TURB positive malignant cells
- “Minimal” abdominal distention
- GU note: no mention of shunt

Flow Rates through the Shunt

- Spontaneous flow occurs when the pressure in the peritoneum is ~3 cm H2O higher that the CVP.

15.5Fr IJ venous end-

- -single valve- **40-55 ml/minute**
- -double valve 25-40 ml/min*

*

(based on pressure head of 10cmH2O)

- Sitting upright stops the flow.

PERITONEO-VENOUS SHUNTING

Absolute Contraindication:

- Peritonitis
- Severe CHF
- Renal Failure

Relative Contraindications

- Hemorrhagic ascites
- Thrompocytopenia
- Hypoalbuminemia

George Getrajdman, MD, Memorial Sloan-Kettering Cancer Center.

Consider PVS:

- For malignant and non-malignant ascites
- As an alternative to conventional (repeated) paracentesis procedures
- For patients awaiting liver transplant
- As a potential alternative to transjugular intrahepatic portosystemic shunts (TIPS)

Peritoneo-venous Shunting Conclusions

- High technical success rate
- "Quick and simple 45-60 min"
- No exteriorized device
- No limitations to lifestyle
- No loss of fluid/protein
- Easily reversible
- Doesn't preclude performing future procedures
- Procedure well suited for Interventional Radiology

George Getrajdman, MD, Memorial Sloan-Kettering Cancer Center, webinar, carefusion.com

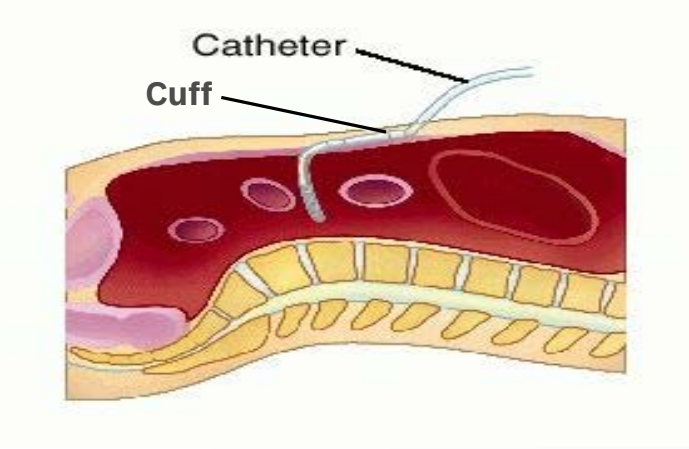
Tunneled Catheters

Tenckoff, Kendall (Covidien)
PleurX, CareFusion (formerly Cardinal Health)
Aspira, Bard
Tunneled vascular catheters

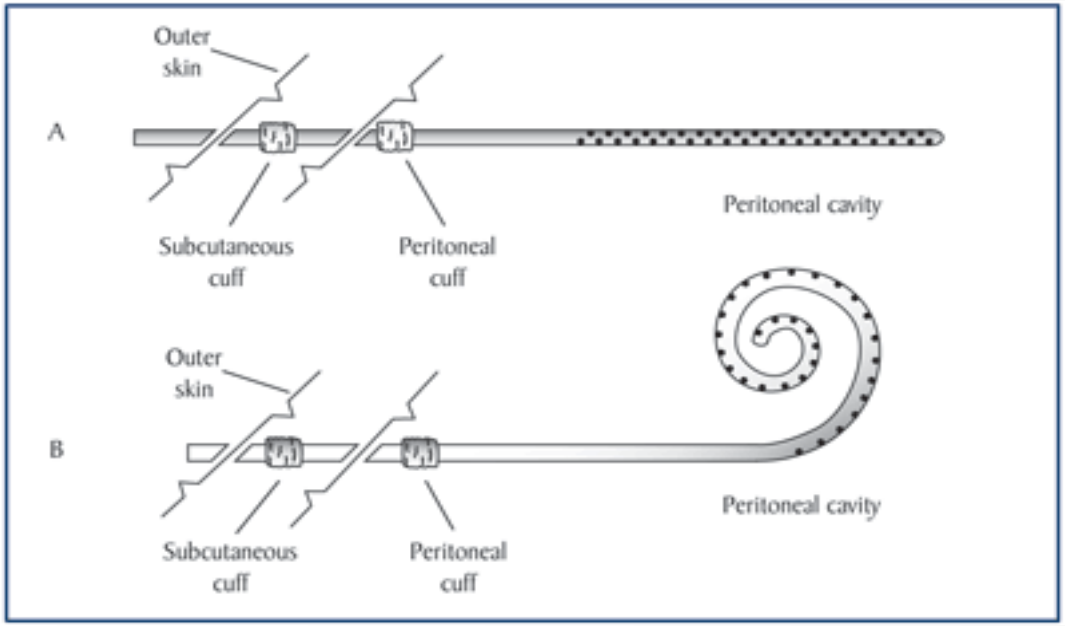
- Intermittent drainage
- Percutaneous approach, conscious sedation
- Out-patient procedure
- Avoid trips to hospital
- More independence

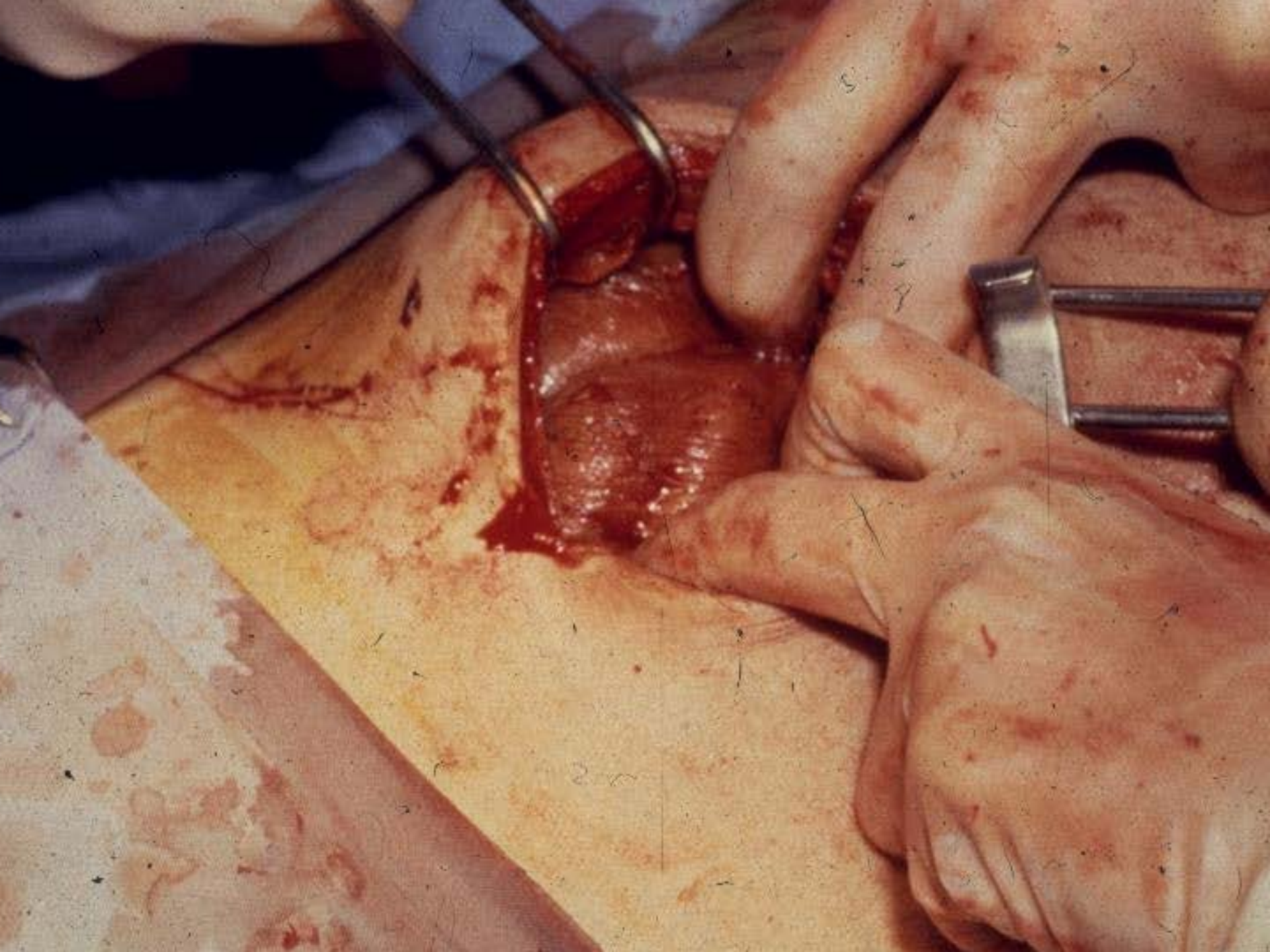
Tenckhoff Catheter

- Off Label Use
- Peritoneal Dialysis catheter
- 15Fr, silicone, 2 cuffs
- Gravity drainage (not vacuum bottle)
- Prone to occlusions, leakage, peritonitis

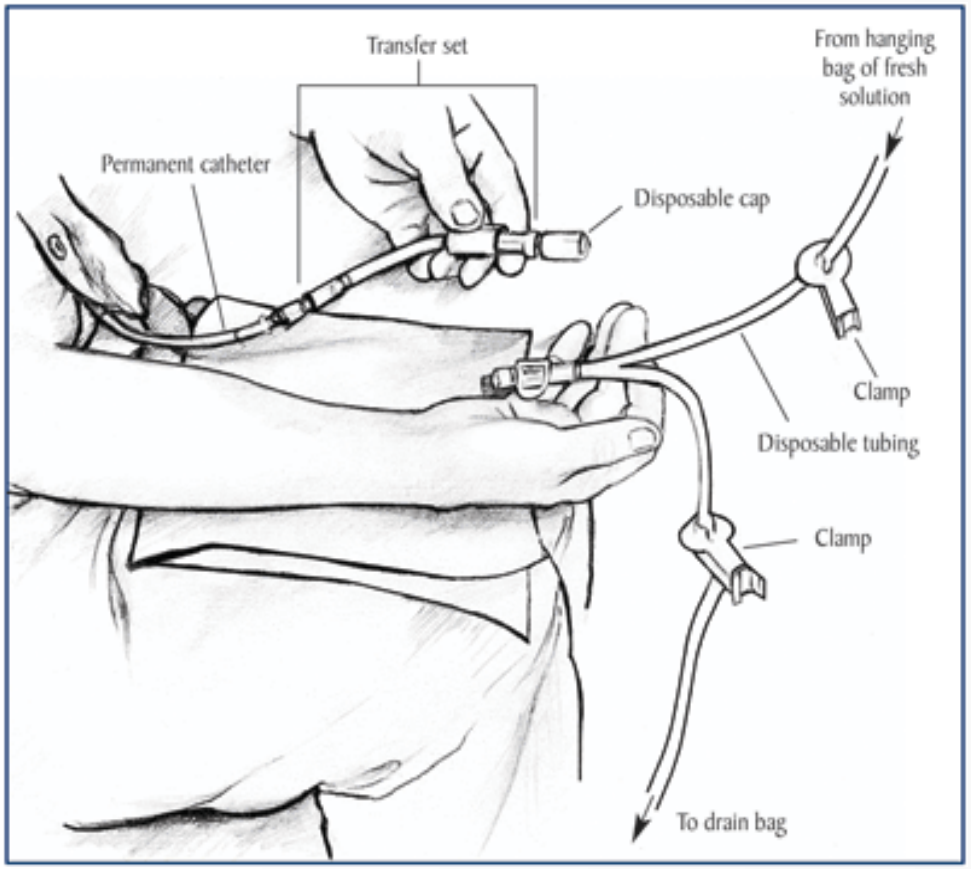


Tenckhoff Catheter

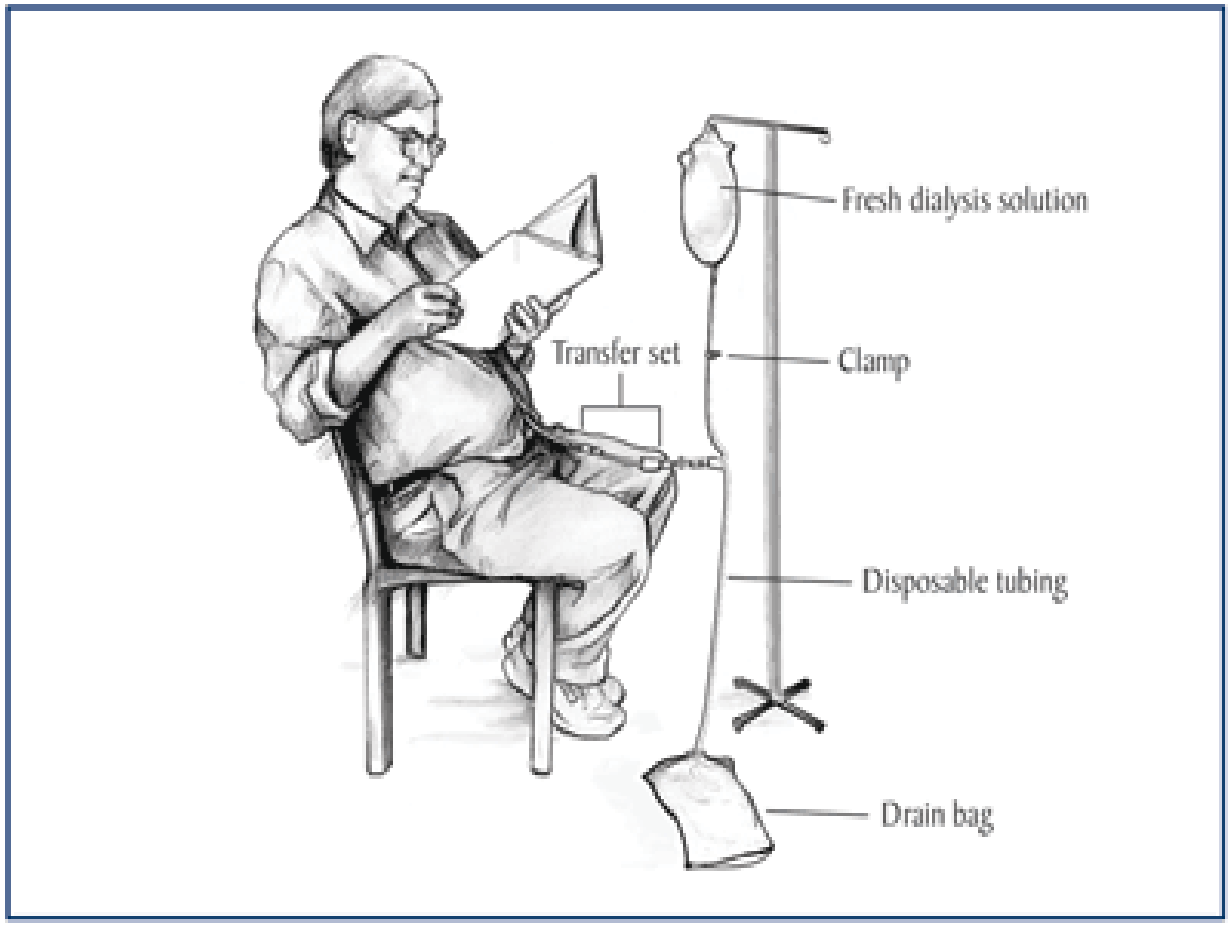




Tenckhoff Catheter



Tenckhoff Catheter



Tunneled Catheter ASPIRA - C.R. Bard

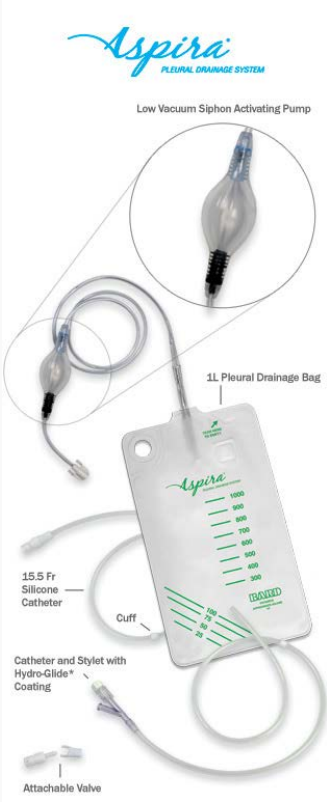
- FDA approval 12/09 for Ascites drainage
- (Prior FDA approved for drainage of pleural effusions)
- Percutaneous placement procedure
- “Low vacuum siphon activating pump system”
- Kit with drainage supplies given at time of placement

www.myaspira.com

Aspira
PLEURAL DRAINAGE SYSTEM

Tunneled Catheter – ASPIRA - C.R. Bard

- Preauthorization not required
- Kit with drainage supplies given at time of placement
- Supplies reordered via Bard hotline 866-443-8090/medical supply co.
- Marketed from 2007 – discontinued selling 2008, now back on market.



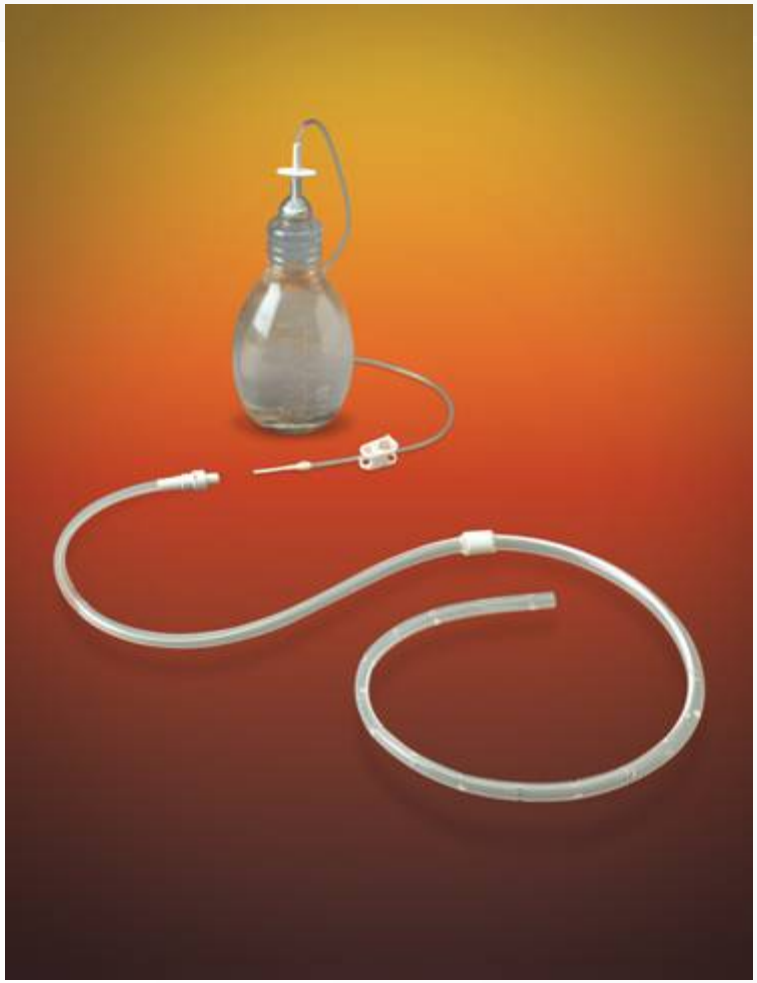
Tunneled Catheter PleurX - CareFusion

(Formerly Cardinal Health)

- ~14 years clinical use (chest and abdomen)
- FDA approval for ascites drainage 11/05
- 15.5Fr, silicone, single polyester cuff, 30 holes
- 1-way valve, no flushing
- Home drainage 5-15 minutes
- Prepackaged supplies sent to home
- Safe, effective, low complication rate
- Similar safety, efficacy and complication rate compared to paracentses*

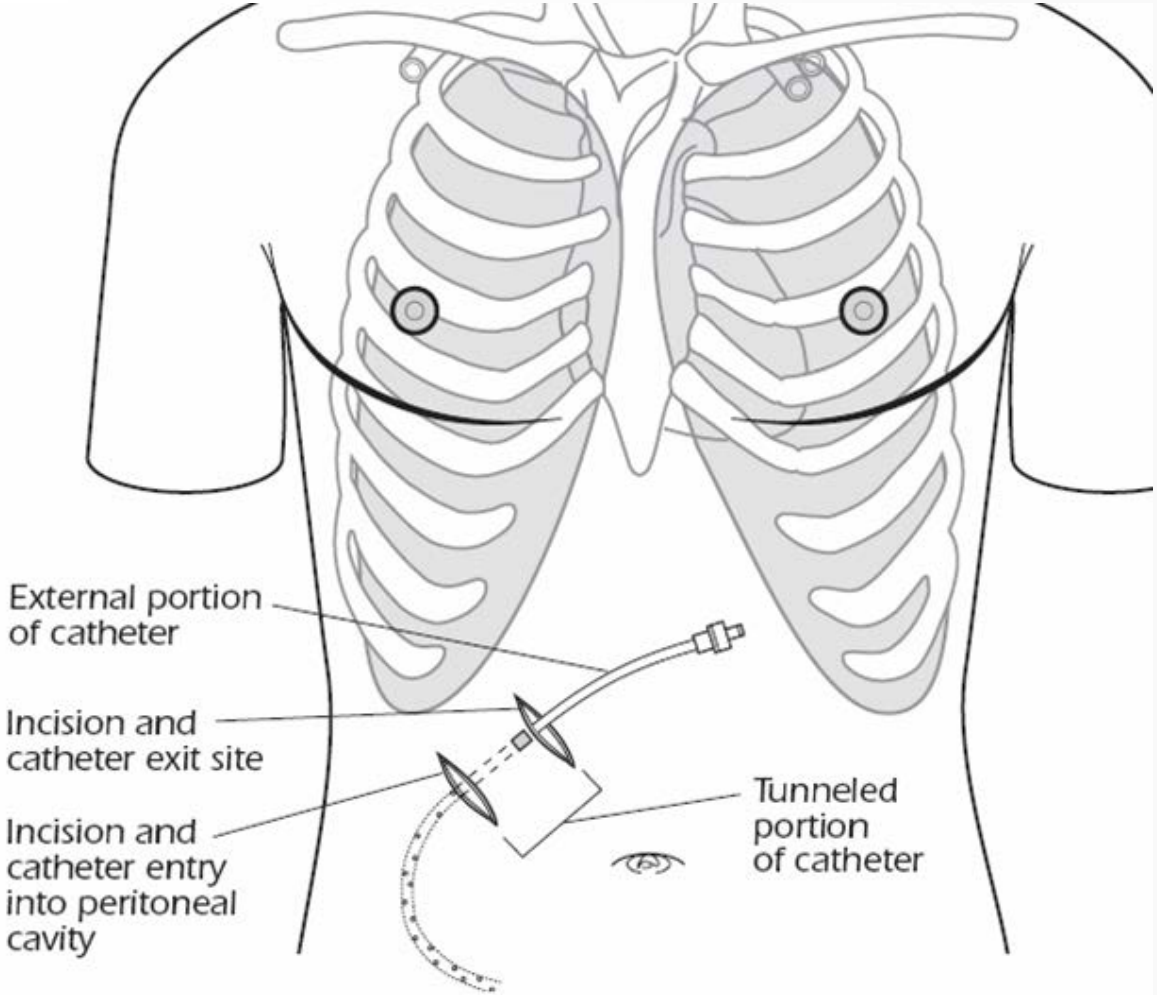
* Rosenberg, et al J Vasc Interv Radiol 2004;15:1129-1131

PleurX Catheter System

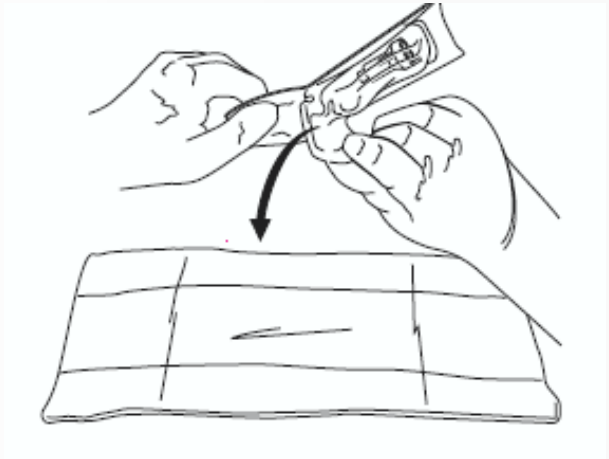


PleurX Catheter System
U.S. Catheter Placement Tray

PleurX Peritoneal Catheter Placement



PleurX drainage kit for home use



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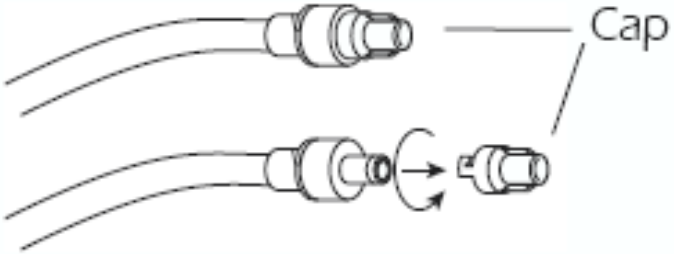
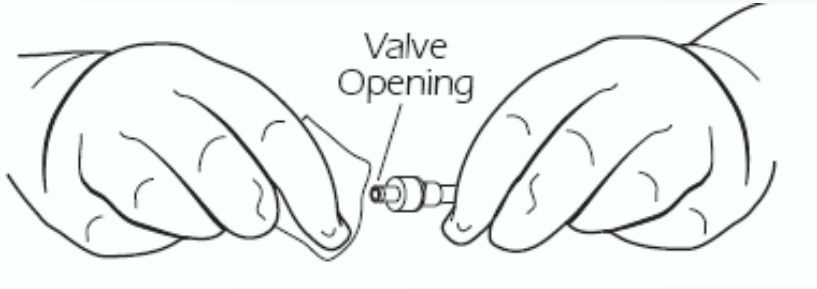
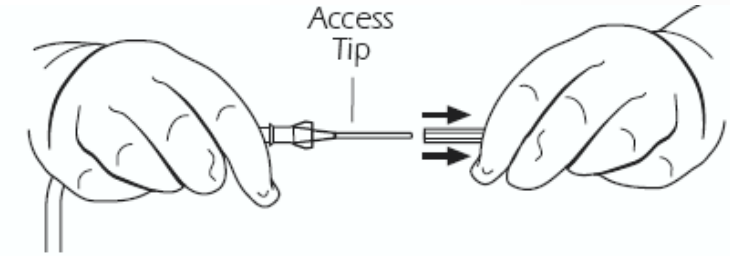
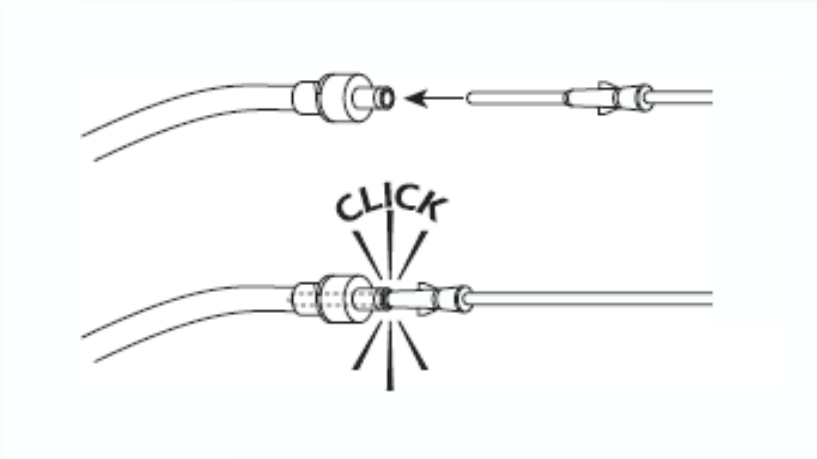
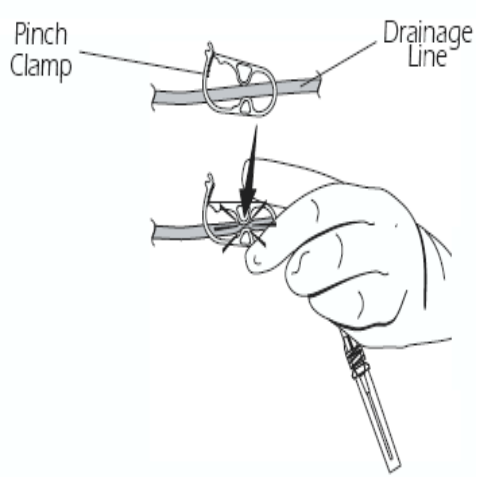


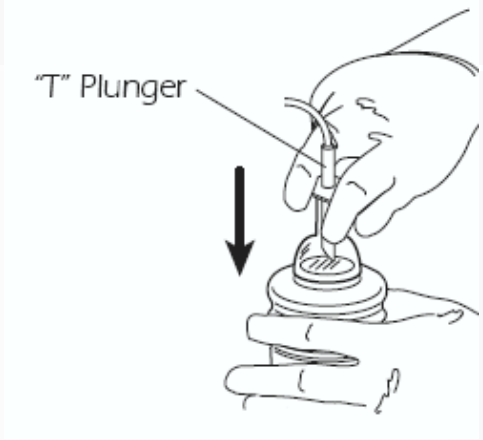


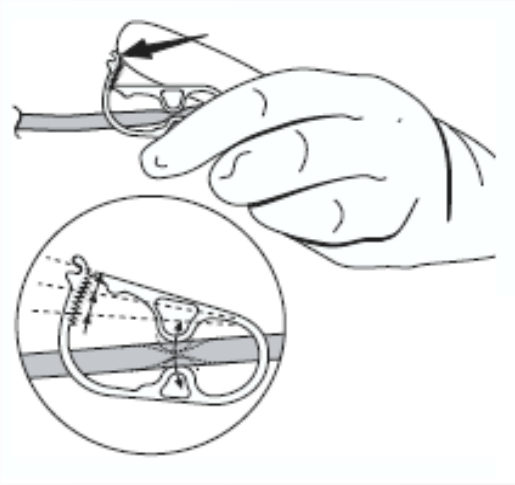




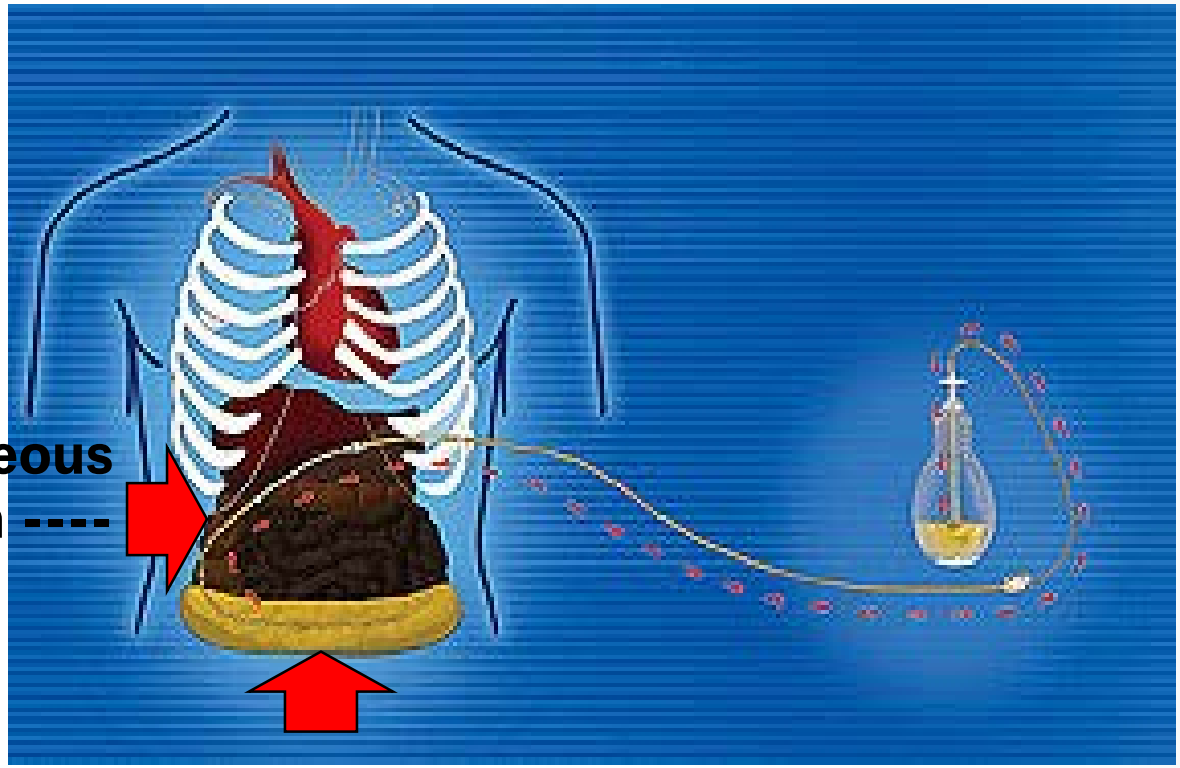
PleurX drainage kit for home use



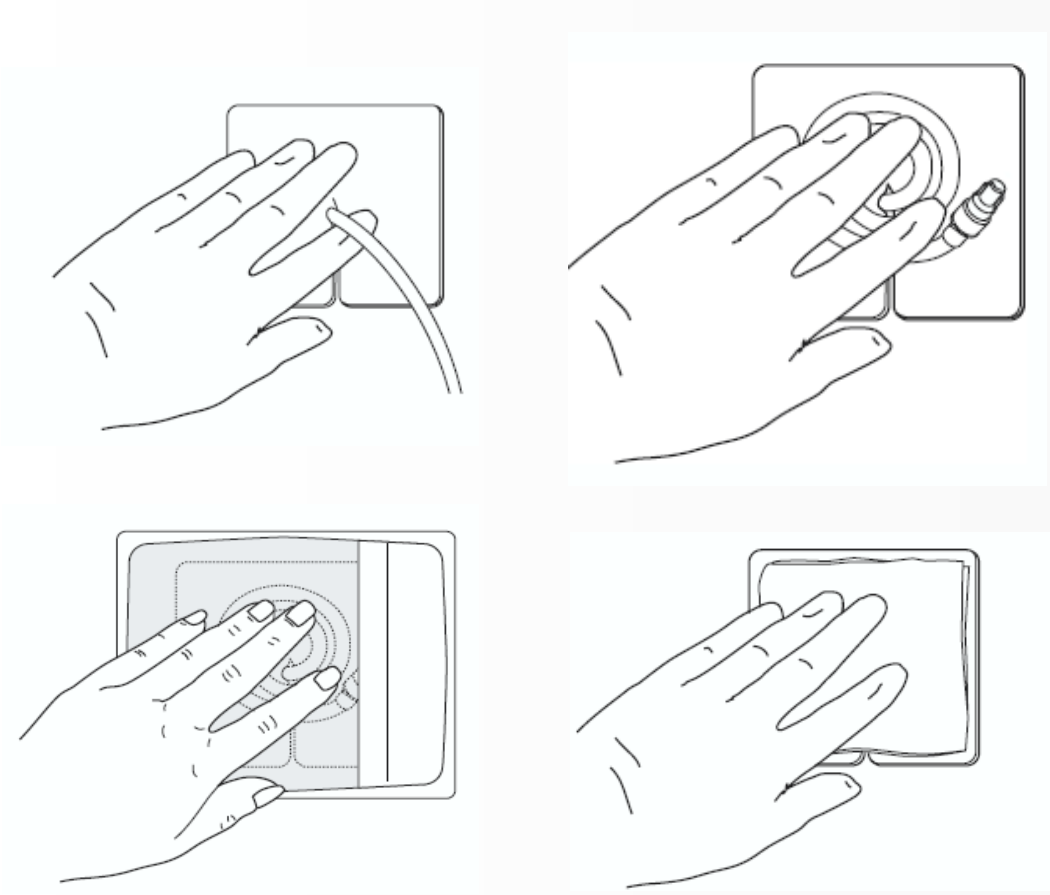




PleurX catheter draining ascites



Dressings



Quality of Life Improved

Tunneled catheter vs paracentesis or other therapies

- Low complication rate, 1 case peritonitis at 10 wks, resolved w ab
- Low failure rate
- Safe (no changes in blood chemistries with 2L/day drainage)
- Patients felt “in control” of their disease
- Most catheters (85%) were functioning at time of death or 12 weeks
- Most common complication leakage at access site, 7/34 (21%); none after technique change
- 41% no adverse events
- Occlusions : 14 occurrences in 4 pts

Courtney A, et al J Vasc Interv Radiol Dec 2008 19; 1723-1731

Recommended practice for pts referred for ascites drainage device

- In-pt: Review hx, imaging, labs, exam. Discuss options w pt/family. Review w Attending IR
- Out-pt: +/_clinic visit for above; meet w IR Attending
- Informed consent
- Review instructions for use; DVD, contact info

Drainage catheter placement:
Pre-procedure

- Standard work-up for IR case
- Clarify DNR status
- Consider Anesthesia consult if deterioration in functional status since initial assessment *if* DNR order not suspended
- Cephalosporin prophylaxis

Catheter Placement

- IVCS and local xylo
- Standard sterile technique/prep
- U/S guidance for access
- Fluoroscopy
- Immediate drainage in procedure room

Catheter Placement

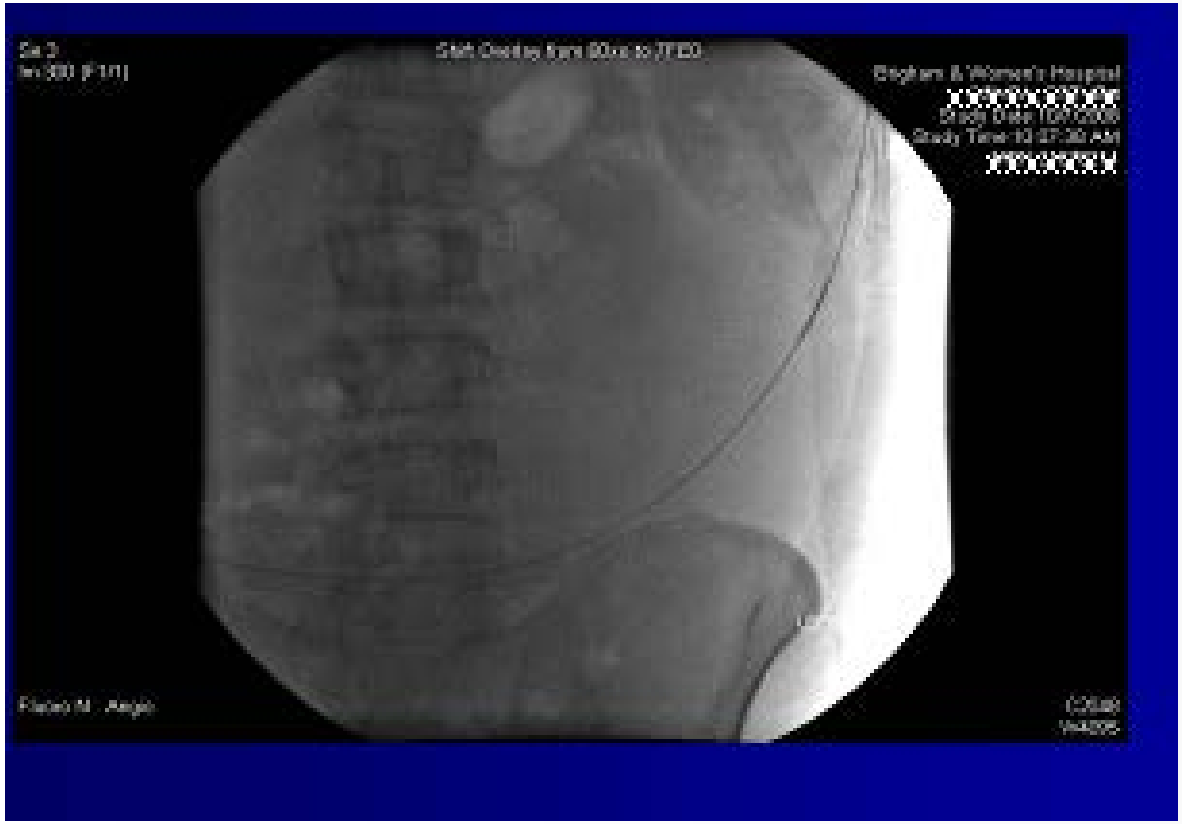
- PleurX placement kit
- Xylocaine/sodium bicarbonate
- Floppy wire
- Berenstein catheter
- +/- Stiff Amplatz wire
- +/- Dilators 12, 14Fr
- 2-0, 4-0 Vicryl, 2-0 Prolene, Dermabond
- Wall suction/Glass vacuum bottles

Catheter Placement

Catheter Placement

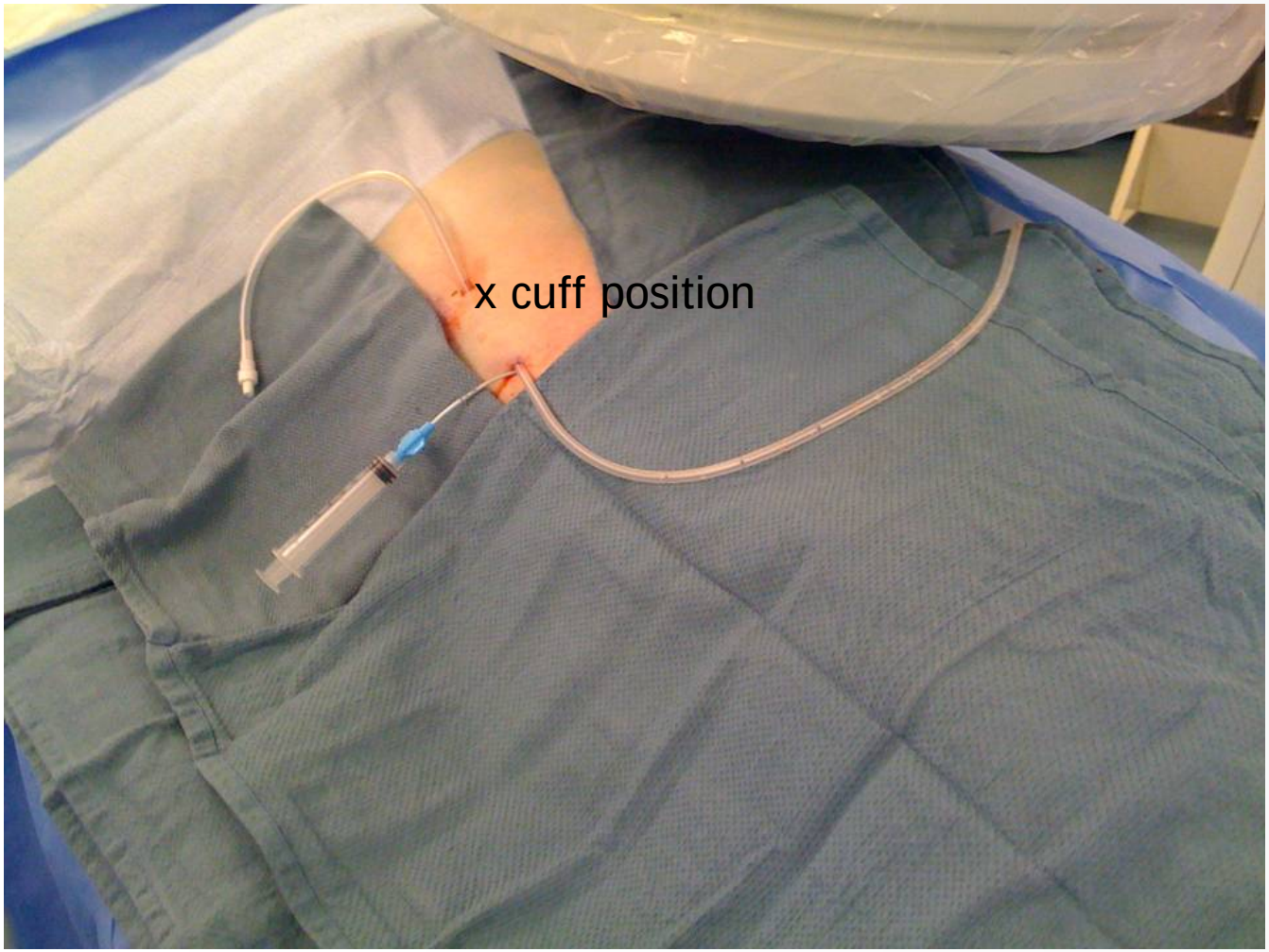
Catheter Placement

Floppy wire, Berenstien catheter



Catheter Placement

Catheter Placement



Catheter Placement
Peel-away sheath

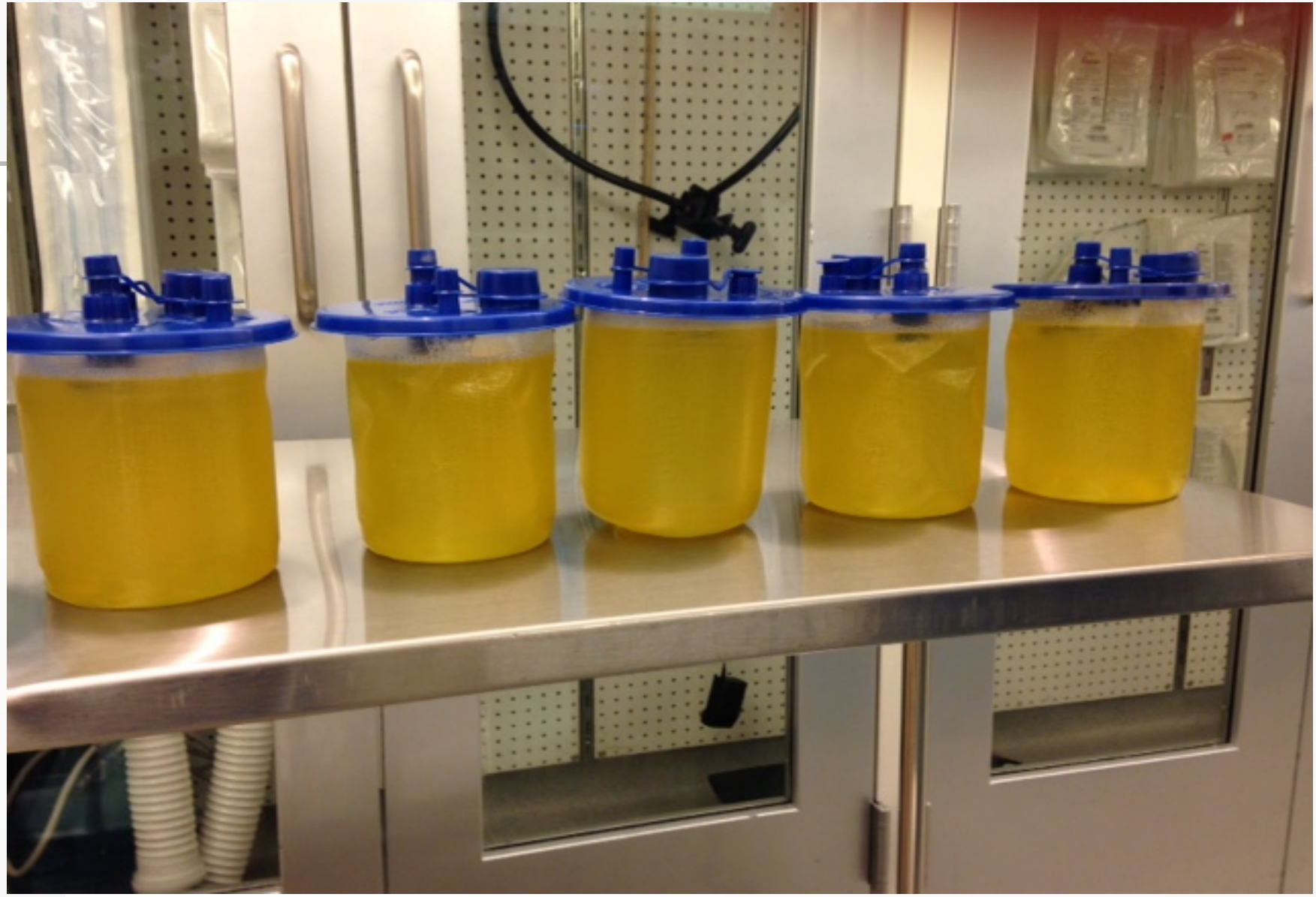
Catheter Placement

Catheter Placement

Oversew access site

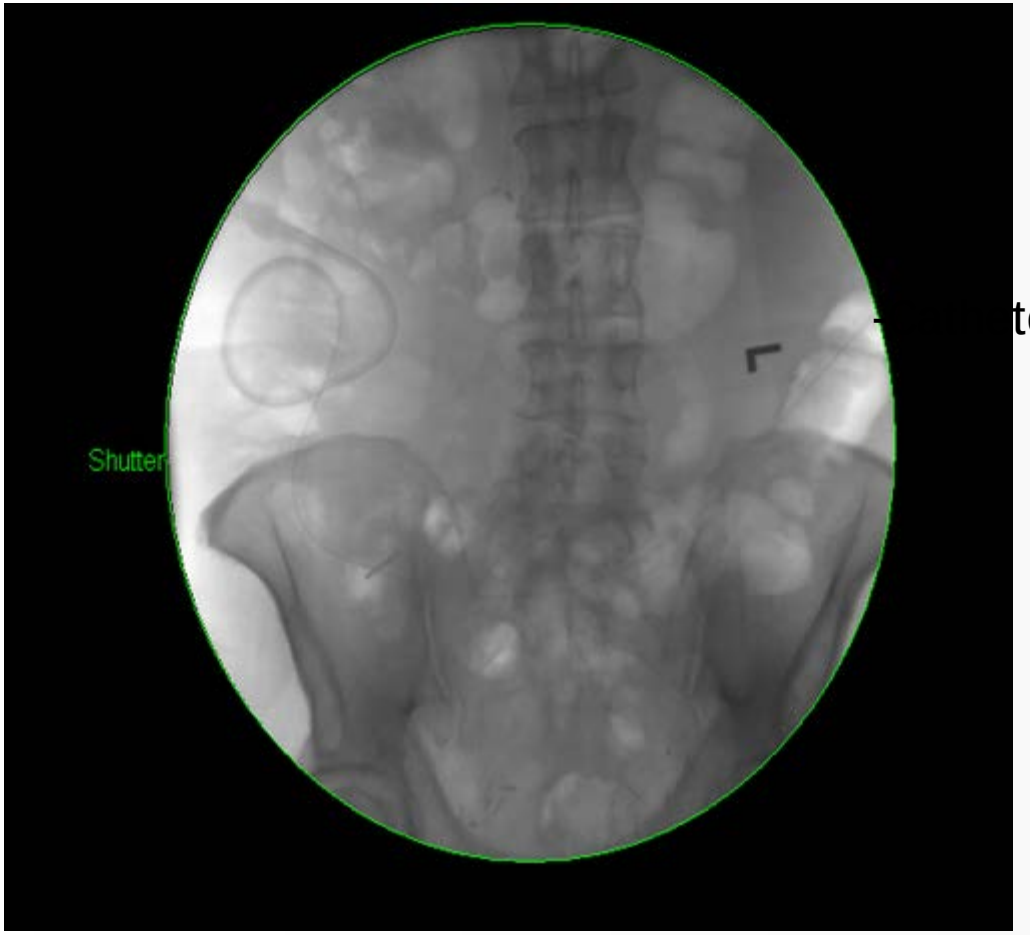
Post-procedure Drainage

Post-procedure Drainage



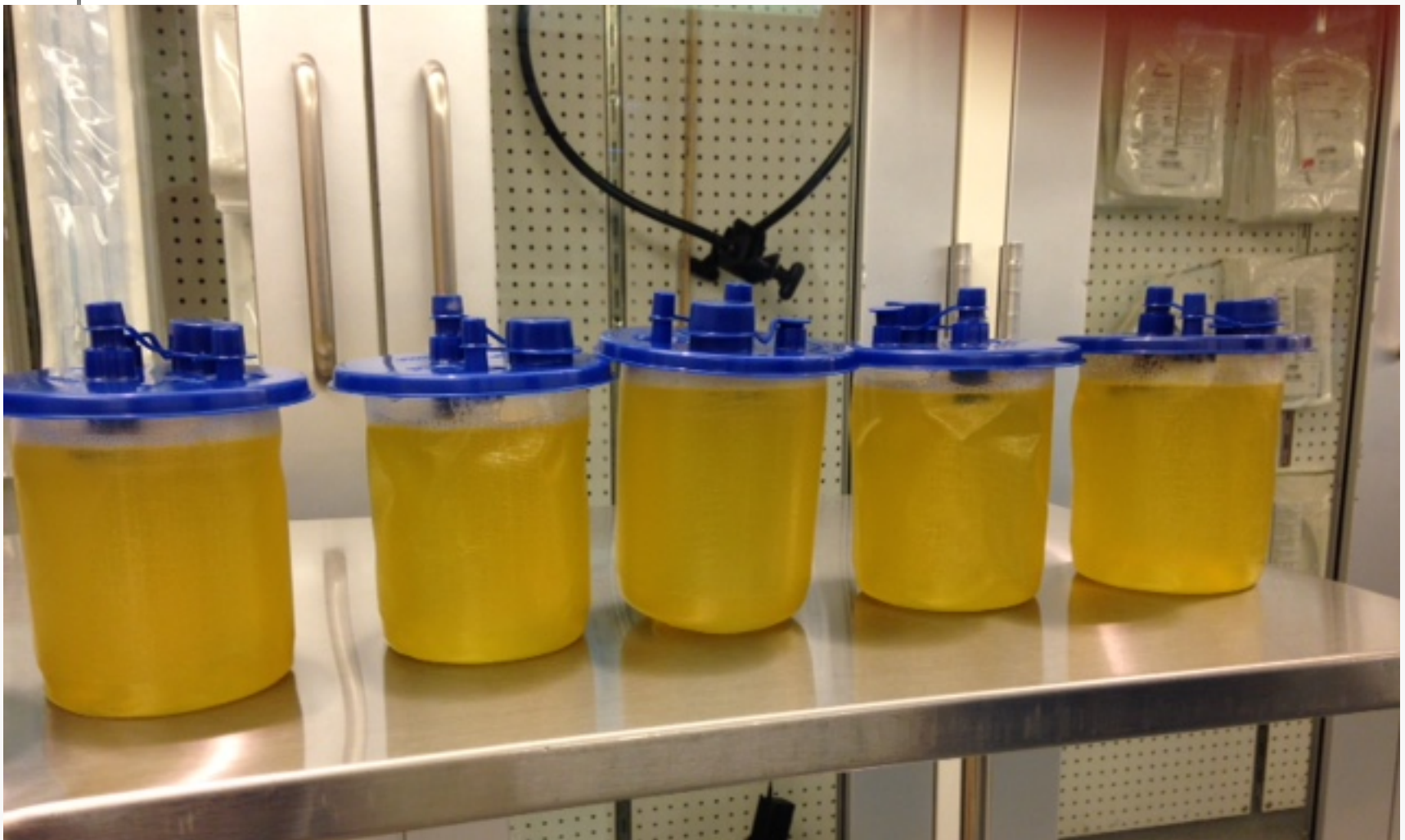
Final Dressing

Post-procedure X-ray



ter tip

Drained Ascites



Post-procedure

- Usual recovery from IVCS
- Fax forms to Edgepark Medical
- Pt instruction sheet
- Customer Service #
- Pt /family calls for drainage kits
- VNA, arranged by IR nursing staff/ Care Coordinator for inpatients
- Drain every 1 to 2 days for 1st 2 weeks

Drainage Catheter Questions

- Frequency of drainage
- Amount of drainage with each procedure
  - Rebound pulmonary edema, hypotension?
  - need for albumin?
- Catheter removal
- Showering, swimming, hot tub use

PleurX, BWH 4/06-12/2014, n=~371 patients

Type of malignancy	no.
GI	81
Pancreatic	59
Ovarian	61
Breast	48
Uterine/cervix/fallopian	22
Renal/Bladder/adrenal	18
Lymphoma, Sarcoma, AML, MDS ,myeloma, myelofibrosis	15
Mesothelioma	12
Unknown primary	13
Neuroendocrine	8
Melanoma	5
Cirrhosis	7
HCC	9
Prostate , testicular	6
Lung	5
Chylous	1
Peritoneal	1

Complications, PleurX 4/06-12/31/14 n=371

Leakage (fewer with technique change and proper use)	22	5.9%
Peritonitis (IV Antibiotics)	13	3.5%
Cellulitis (PO Antibiotics)	11	2.9%
Removed, no longer needed	7	1.8%
Loculations requiring taps	4	1.0%
ARF (CRI)	3	0.8%
Malposition/ changed	2	0.5%
Pain requiring removal	1	0.2%
Infection requiring removal	1	0.2%
tPA lysis of fibrin clot	1	0.2%
Mechanical fibrin disruption	1	0.2%
Procedure related deaths	0	0
Technically successful placement		100%

Unpublished data BWH , Jan 2014

Total patients =371, 2 pt had replacement, 1 had revision
1 w peritonitis/cellulitis – loculations, removed day 236.

Peritoneal Ports

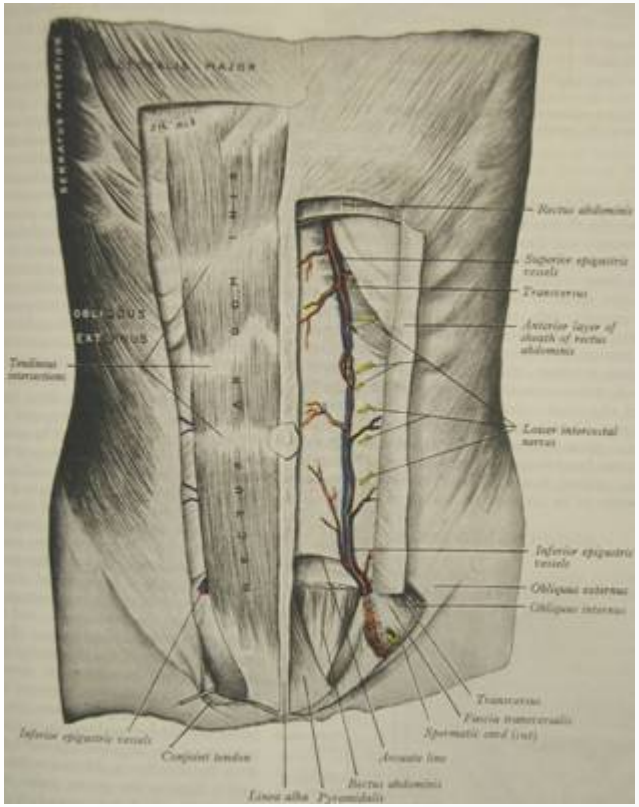
- Horizons, Smiths (Deltec)
- 16Fr, single cuff, numerous side holes
- FDA approved for ascites drainage
- 1st described 2002
- Good long term patency
- Totally implantable
- Safe
- Effective, when using peritoneal port placed over ribs

Peritoneal Ports

Draw backs:

- Complications similar to tunneled catheters
- No prepackaged kits for home drainage
- Pain with needle access
- Requires heparin flushes
- Leak at access site, most common minor complication
- Lack of nursing familiarity with use,
- Requires needle placement, deaccessing, disposal not a skill expected of family or patient
- Drainages take take longer than catheter (18g needle)

Procedure (peritoneal port)
Midline approach, avoids epigastric vessels



Peritoneal Port placement, similar technique to tunneled catheter procedure

Peritoneal Port placement

Reservoir located over lower ribs --

Peritoneal port

Literature

Author published in	*Type*	*N*	*Follow-up (d) mean; range*	*Infection peritonitis; cellulitis*
Lee Supp Care Cancer 2000;8(6):493-499	Catheter	30*	37	Peritonitis 13/30;
Richard III JVIR 2001;12(3):373-375	Catheter	10	70 (1-100)	none
O'Neill AJR 2001;177(3):615-618	Catheter (dialysis)	24	50	Peritonitis 3/24;
Barnett JVIR 2002;13(4):379-383	Catheter	29	51 (9-218)	Peritonitis none; cellulitis 1/29
Rosenbloom JVIR 2001;12:1343-1346	Port	9	210 (31-444)	Peritonitis 3/9;
Rosenthal unpublished	Port	20	85 (10-350)	Peritonitis 1/20; cellulitis 3/20

Abstract presentation at SIR 2003 Annual Scientific Meeting

Drainage device patient selection

- Accepting of catheter and semi-permanent status of catheter
- Must be motivated to learn new skill
- Should have caregiver available for assistance
- History of compliance with medical regimens
- Amenable to home care follow-up

Factors to consider in choosing drainage device

- Life expectancy/functional status
- Risk of bleeding/infection
- Presence/absence of loculations
- Referring clinician
- Insurance coverage
- Patient support e.g. education & supply replenishment, etc.

Conclusion

Recurrent malignant ascites is often disabling and reduces the quality of life.

The goal of management of malignant ascites is palliation, improve quality of life and to help the patient and family choose a treatment option that best fits with the patient’s wishes.

Treatment options include: paracentesis, non-tunneled drainage catheters, peritoneo-venous shunts, tunneled catheters, and ports.

Conclusion

Clinicians can play a key role in educating patients and family about malignant ascites. By counseling them early in the course of their disease, home management options are not delayed until life expectancy is days or weeks.

References

- Reynolds TB, Ascites Clin Liver Dis 2000;4:157-68
- Brooks RA, Herzog TJ Gyn Oncology 101(2006)360-362
- Rosenberg, S , Gastroenterology Clinics of North America March 2006 vol 35
- Parsons SC, et al Eur J. Surg Oncol 1996;22:237-9
- Tito L, et al Hepatology, 1988;8:22-31
- Lee A, Lau TN Indwelling catheters for the management of malignant ascites.
- Support Care Cancer 2000;8:493-9.
- Jong Yun Won et al , J Vasc Interv Radiol 2008;19:1717-1722
- www.myaspira.com
- Rosenberg, et al J Vasc Interv Radiol 2004;15:1129-1131
- Courtney A, et al J Vasc Interv Radiol Dec 2008 19; 1723-1731