Surgical Material

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Ideal characteristic

- Sterile
- All-purpose (composed of material that can be used in any surgical procedure
- Easy to handle
- Holds securely when knotted (ie. No fraying or cutting)
- High tensile strength
- Favorable absorption profile
- Resistant to infection

Unfortunately there is no single material with suit for all character

Essential characteristic

- Sterile
- Uniform diameter and size
- Pliability for ease of handing and knot security
- Uniform tensile strength by suture type and size
- Freedom from irritants or impurities that would elicit tissue reaction

Other characteristics

- Capillarity : extent to which absorbed fluid is transferred along the suture

- Elasticity : measure of the ability of the material to regain its original form and length after deformation

Other characteristics

- Plasticity : measure of the ability to deform without breaking and to maintain a new form after relief of the deforming force

- Memory : inherent capability of suture to return to or maintain its original gross shape (*related to elasticity, plasticity, and diameter*)

Other characteristics

- Pliability : ease of handling of suture material ; ability to adjust knot tension and to secure knot (*related to suture material , filament type , and diameter*)
- Coefficient of friction : measure of slipperiness of the suture
  - High coefficient : more difficult to pass tissue BUT more pliable

Other characteristics

- Tensile strength : measure of a material or tissue’s ability to resist deformation and breakage

Natural vs Synthetic

- Natural : derive from mammal intestine
- Synthetic : derive from polymer
- Natural suture has more tissue reaction and antigenicity

Monofilament vs multifilament

- Monofilament : single fiber
  : more resistant to infection
  : easier pass through tissue
- Multifilament : braided multiple fiber
  : softer but more friction
  : good knot security and pliability
  : more infection

Absorbable vs Non-absorbable

- Absorbable

  Natural : catgut

  systhetic : dexon, vicryl, PDS, maxon,monocryl

- Non-absorbable

  Natural : silk, steel

  systhetic : nylon, prolene, novafil

Catgut

Derive from sheep intestine

- Plain gut : tensile strength 7-10 days
  : complete absorb in 70 days
  : suitable for rapid healing wound
  eg. Oral mucosa and perineum
- Chromic gut : plain gut treat with chromium salt
  : tensile strength 10-14 days
  : more tissue reaction than plain gut

Catgut

Disadvantage

- Suture breakage
- Variable tensile strength

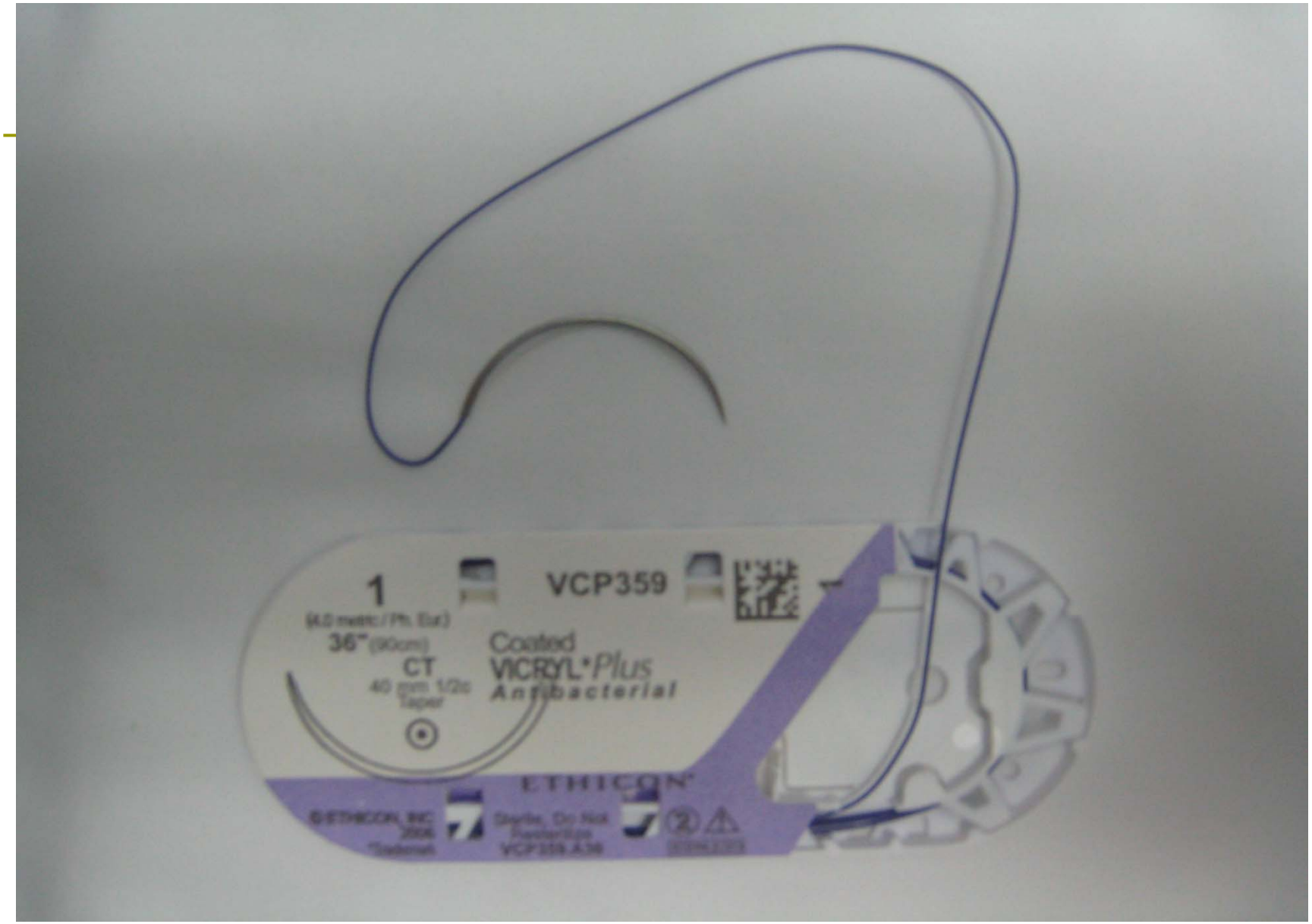
Dexon

- Polyglycolic acid
- Synthetic braided polymer
- Excellent knot security
- 50% tensile strength at day 25
- Use for closure of subcutaneous tissue


4-0
1.5 Metric
9612-31
DEXON II
Coated Braided Absorbable
Polyglycolic Acid Suture
30" 75 cm
BEIGE
C-13
CUTTING
3/8
19 mm
Syneture
LOT B6M0040C
Exp. 2011-11

Vicryl

- Polyglactin
- Synthetic braided polymer
- Easily tissue penetration
- Good knot approximation
- 50% tensile strength at day 28
- Complete absorb in 56-70 day


1
VCP359
36"
CT
Coated
VICRYL* Plus
Antibacterial
ETHICON

PDS

- Polydioxanone
- Monofilament suture
- Slight tissue reaction
- Long tensile strength : 70% at day 14
  : 25% at day 42
- Complete absorb in 6 month
- Stiff
- poor handling and knot security


3-0
(2 Ph. Eur.)
ETHICON
PDS II
PolyDioxanone
W9124
SH PLUS
70 cm

Maxon

- Polyglyconate
- Similar character to PDS
- Tensile strength : 81% at day 14

  : 59% at day 28

  : 30% at 6 weeks
- Complete absorb in 180-210 days
- Easier to handle and has greater knot security


3-0
MAXON
C-13
1.8" 45 cm

Monocryl

- Polyglecaprone
- Monofilament
- Superior pliability
- Tensile strength : 50-60% at day 7
  : lost at 21 days
- Complete absorb at 90-120 days


4-0
MONOCRYL
W3205
45

	gut	dexon	vicryl	PDS	maxon	monocryl
handling	fair	good	good	poor	good	excellent
Knot security	poor	good	fair	poor	good	good
Tensile strength	low	high	high	moderate	high	high
Coefficient of friction	high	high	medium	low	low	low
Memory	low	low	low	high	low	low
Tissue reaction	high	moderate	moderate	low	low	low

Silk

- Easy handling
- Excellent knot security
- High tissue reaction and infection


3-0
BB-2
75
ETHICON
MERSILK*
SOIE PERMA-HAND*
PERMA-HAND* SEIDE
SETA
PERMA-HAND* ZIJDE
ETHICON, INC.
W598
3-0

Steel

- Stain less steel
- Mono and multifilament
- Minimal tissue reaction
- Poor handling and injury to user
- Use in orthopedic or thoracic operation

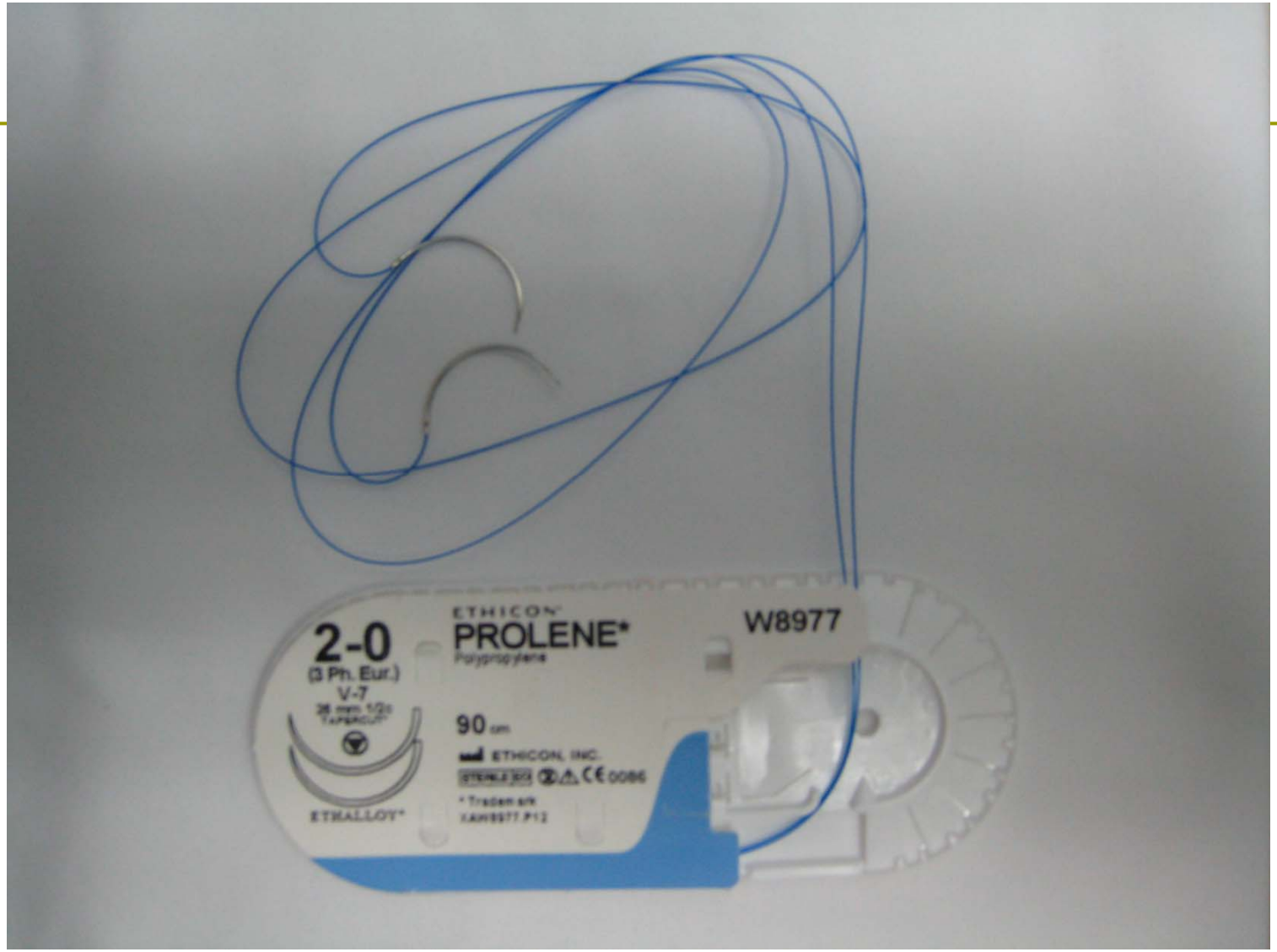
Nylon

- Polyamide polymer suture
- Mono and multifilament
- High tensile strength
- Minimal tissue reaction
- Resist to infection
- Stiff , poor handling and knot security


Dafilon
4/0
75 cm
DS19
B BRAUN

Prolene

- Polypropylene
- Biologic inert → non absorb
- Maintain tensile strength upto 2 years
- High memory, poor handling


ETHICON
PROLENE*
Polypropylene
W8977
2-0
(3 Ph. Eur.)
V-7
90 cm
ETHICON, INC.
ETHALLOY*

Polybutestor (Novafil)

- Newest monofilament
- High tensile strengthnonabsorbable suture
- Good handling
- Low memory
- Secure knot placement
- Unique elastic property allow respond to wound edema and return to original length

	silk	Nylon monofilament	Nylon multifilament	Prolene	Novafil
handling	excellent	poor	fair	poor	good
Knot security	excellent	poor	fair	poor	good
Tensile strength	low	high	high	high	high
Coefficient of friction	high	low	high	Very low	Very low
memory	low	high	medium	Very high	low
Tissue reaction	high	low	moderate	low	low

Suture selection factor

- Location
- Infection
- Cosmetic
- Cost

Suture selection factor (cont.)

- Smallest suture that adequate hold wound edge
- In potentially contaminate wound, monofilament suture are preferable
- Use absorbable suture in potential stone forming organ eg. Bile duct, urinary system
- Consider non-absorbable suture in slow healing tissue fascia, tendon

Vascular access catheter

Common use for

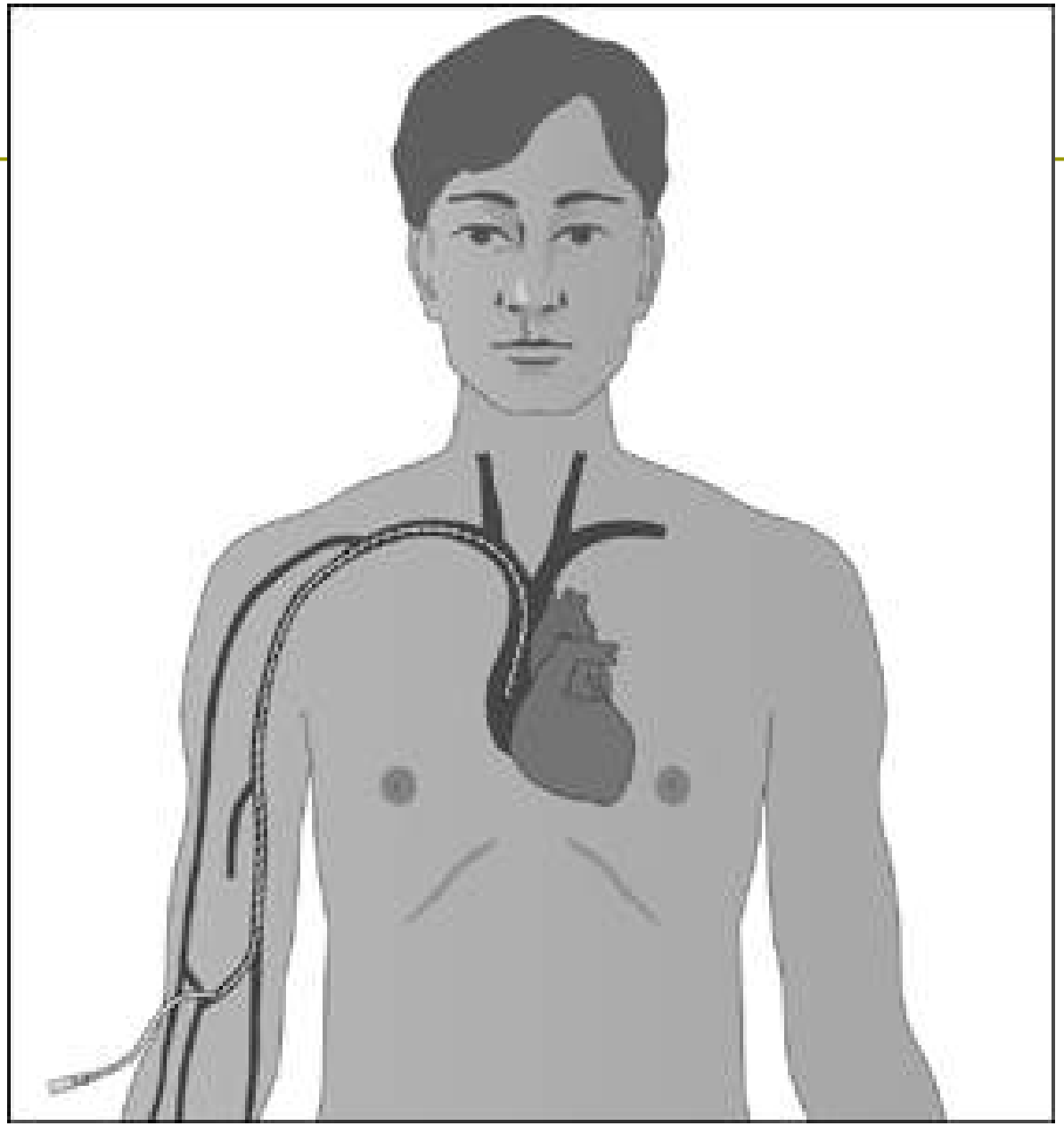
- Intravenous antibiotic treatment
- Chemotherapy
- Long term intravenous nutritional support
- hemodialysis

Catheter

- PICC (peripheral inserted central catheter)
- Non tunneled central catheter
- Cuffed-tunnel catheter
- Port catheter

PICC

- Long catheter extend from arm vein into SVC
- Provide central venous access for several weeks



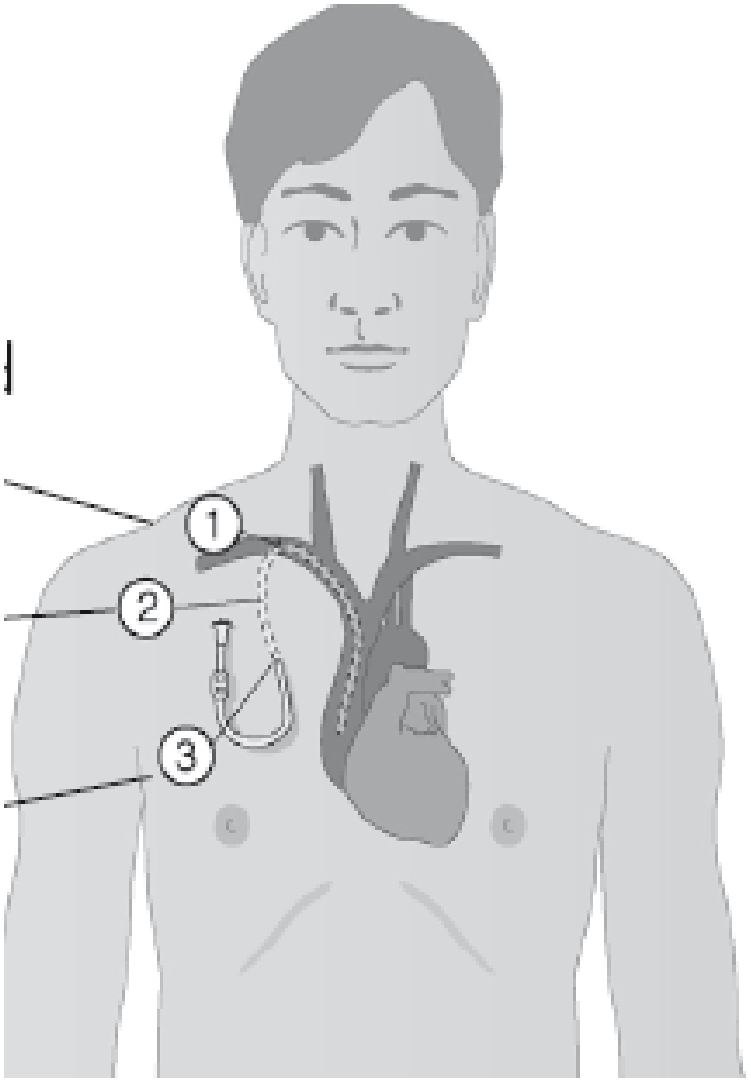
Non-Tunnel Catheter

Larger than PICC

Insert to central vein

Cuff-Tunneled Catheter

- Insert to central vein
  - Prefer Right Internal Jugular vein
- Tunnel through subcutaneous and exit to skin
- Dacron cuff just above exit site induce tissue incorporate
- Disadvantage
  - External catheter
  - Infection
  - Need periodic flushing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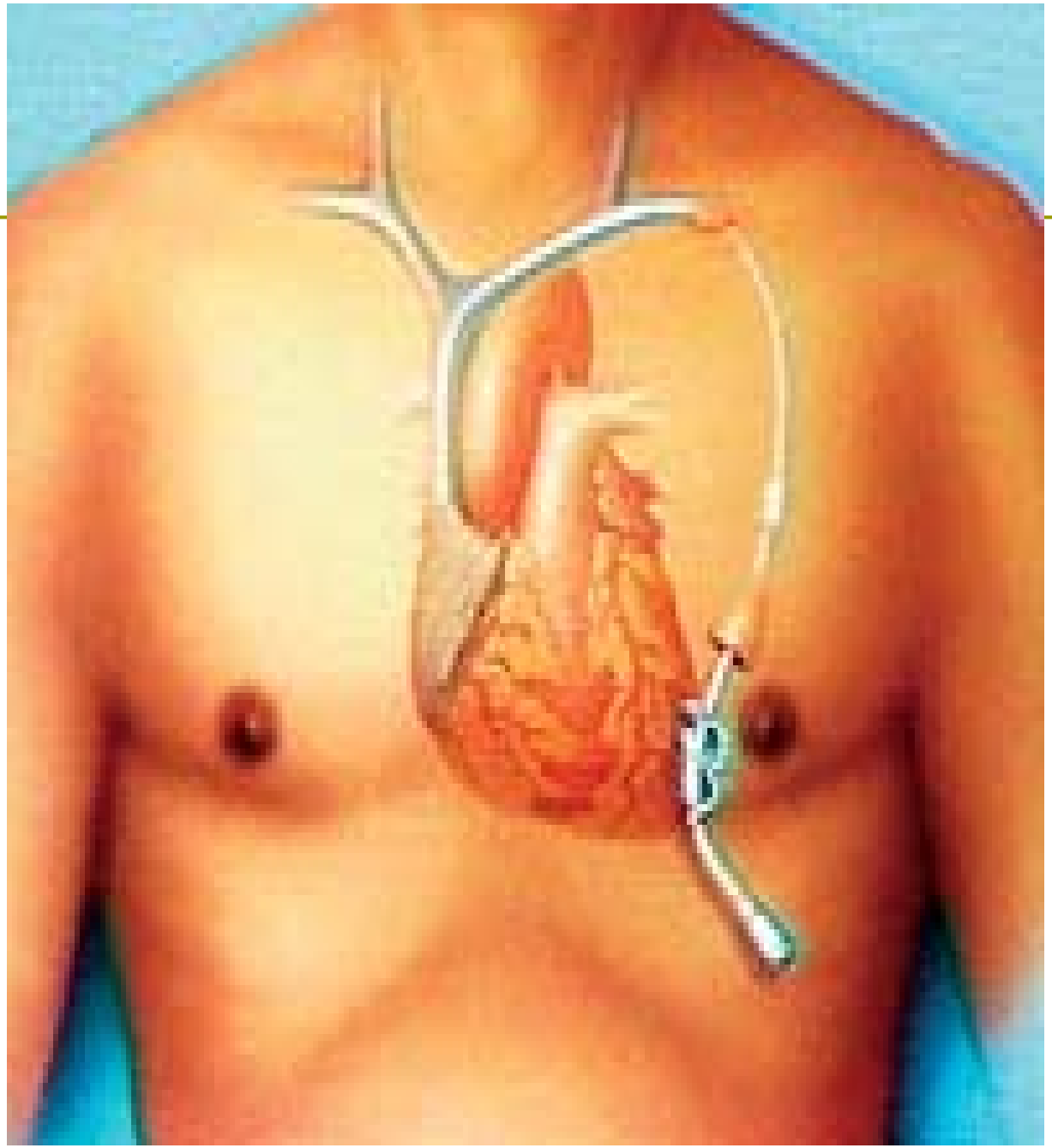
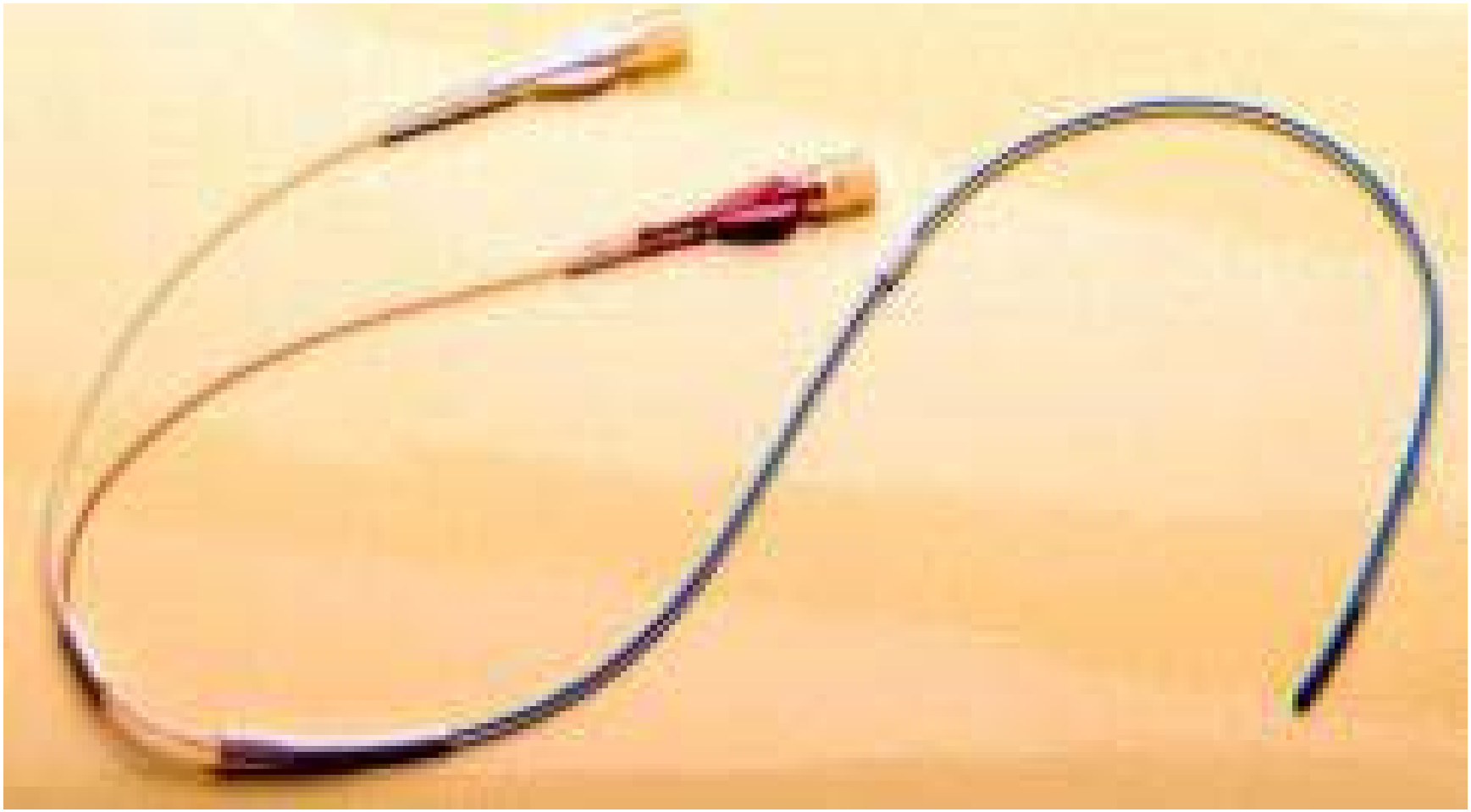
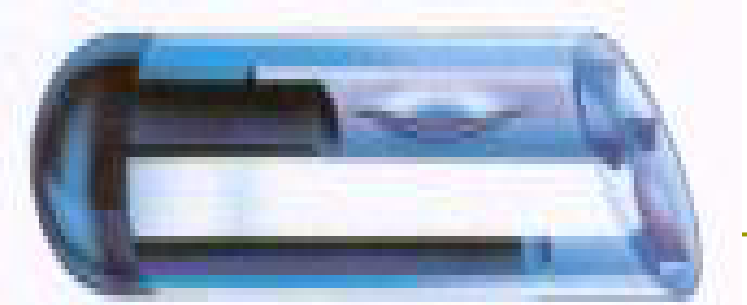


Hickman catheter

Broviac catheter

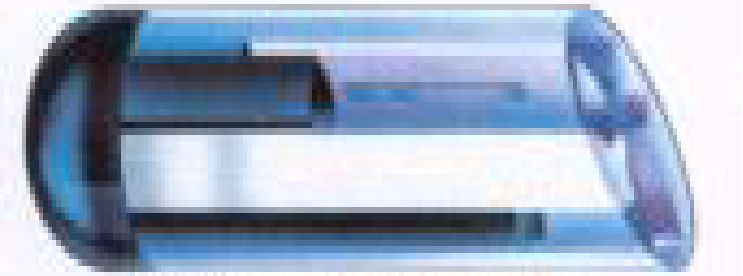
Groshong catheter





Aspiration (negative pressure)

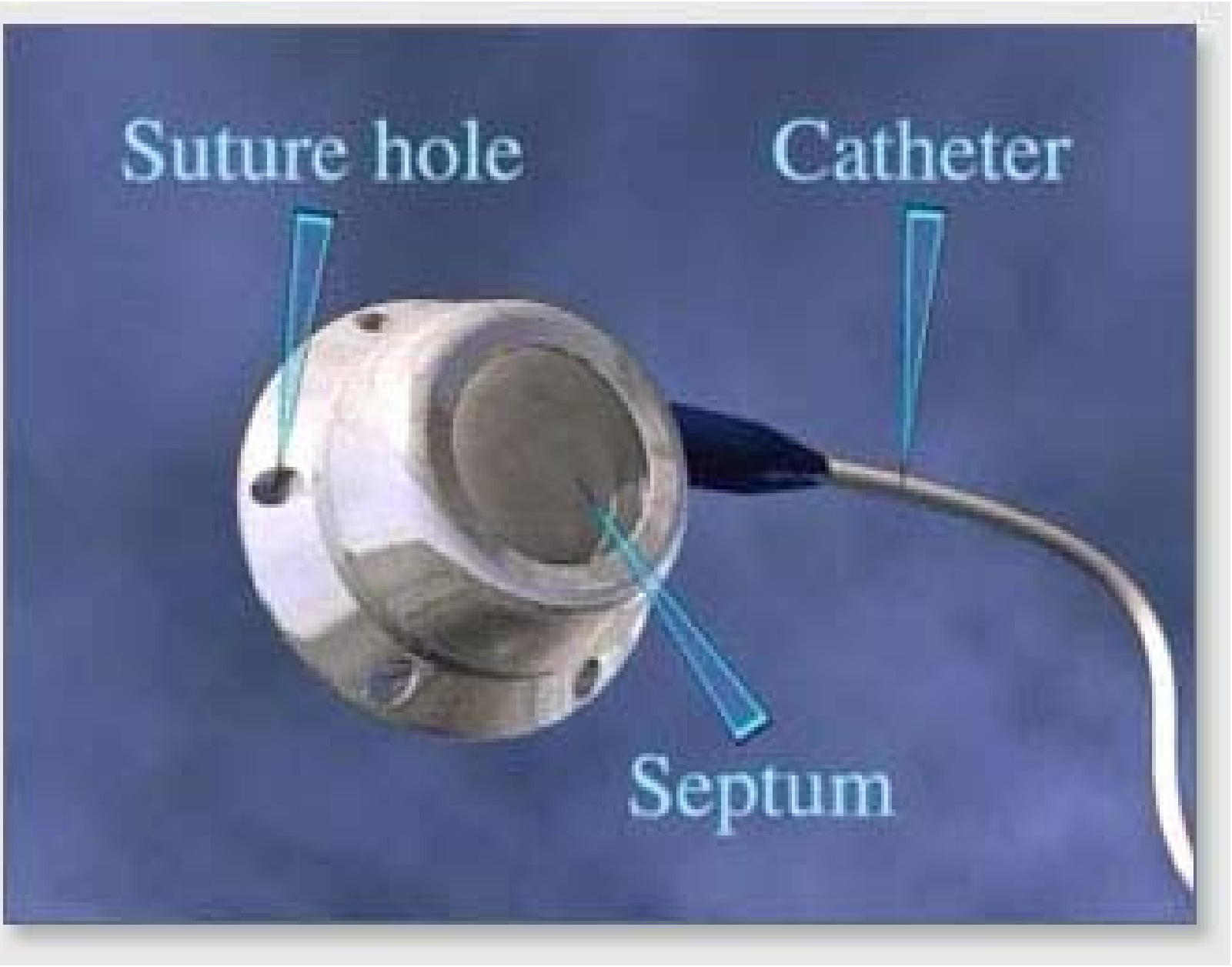
Infusion (positive pressure)

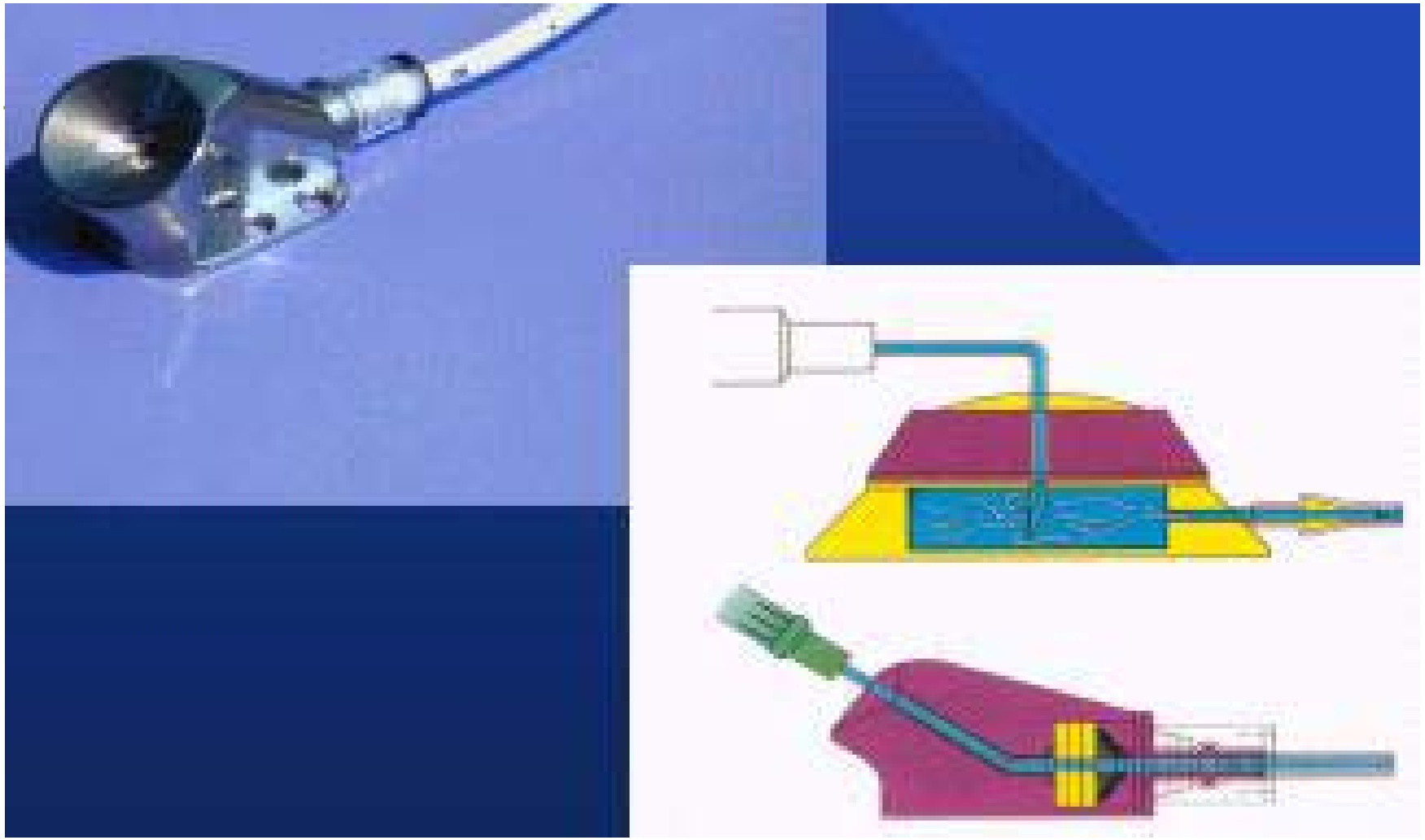


Closed (no pressure)

Port Catheter

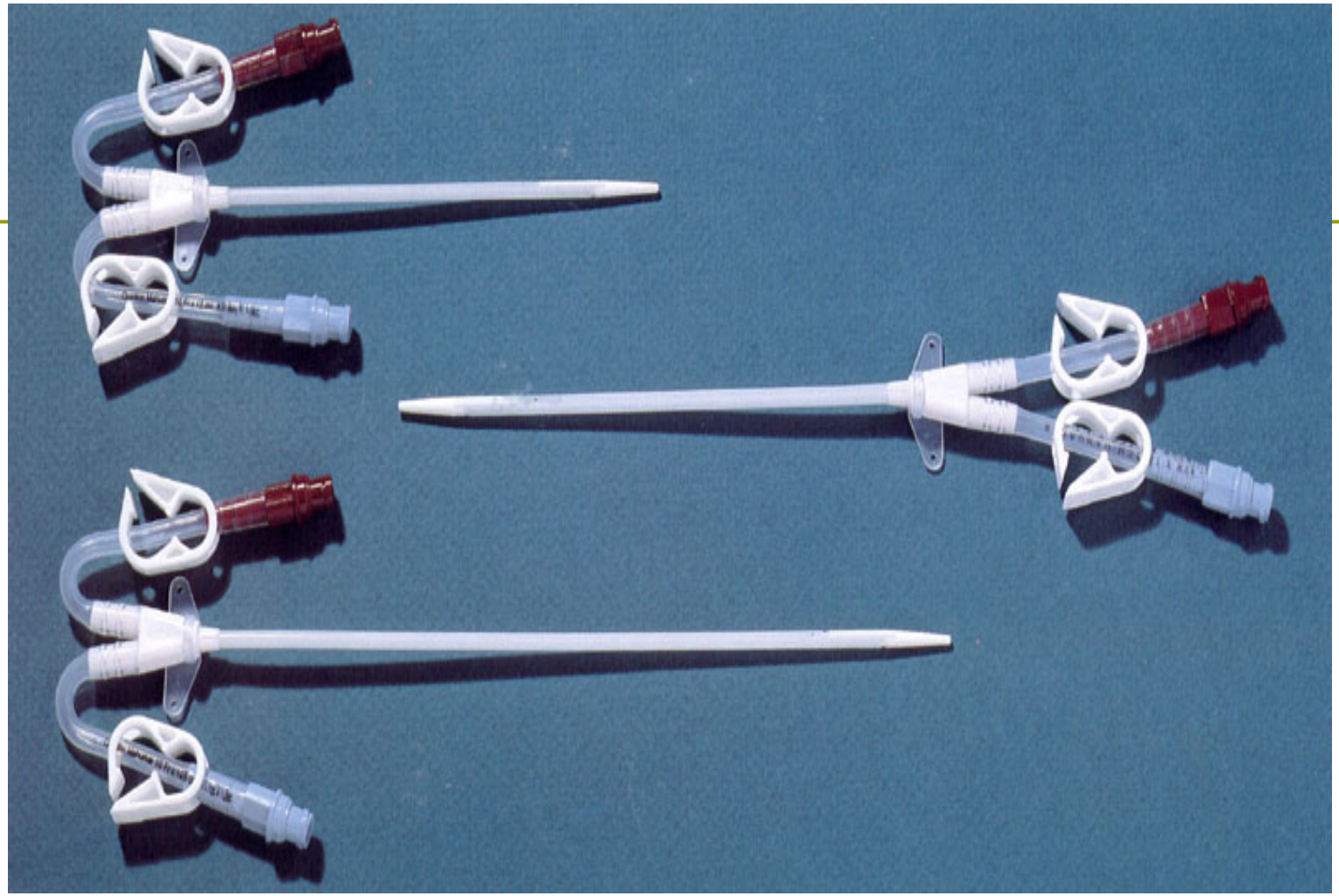
- Subcutaneous implantable port
- Permanent device
- Consist of catheter attach to small reservoir place under skin


Suture hole
Catheter
Septum



Catheter for hemodialysis

- Temporary central venous catheter
  - Emergency hemodialysis
  - Bridge for mature permanent vascular access
  - Infected CAPD

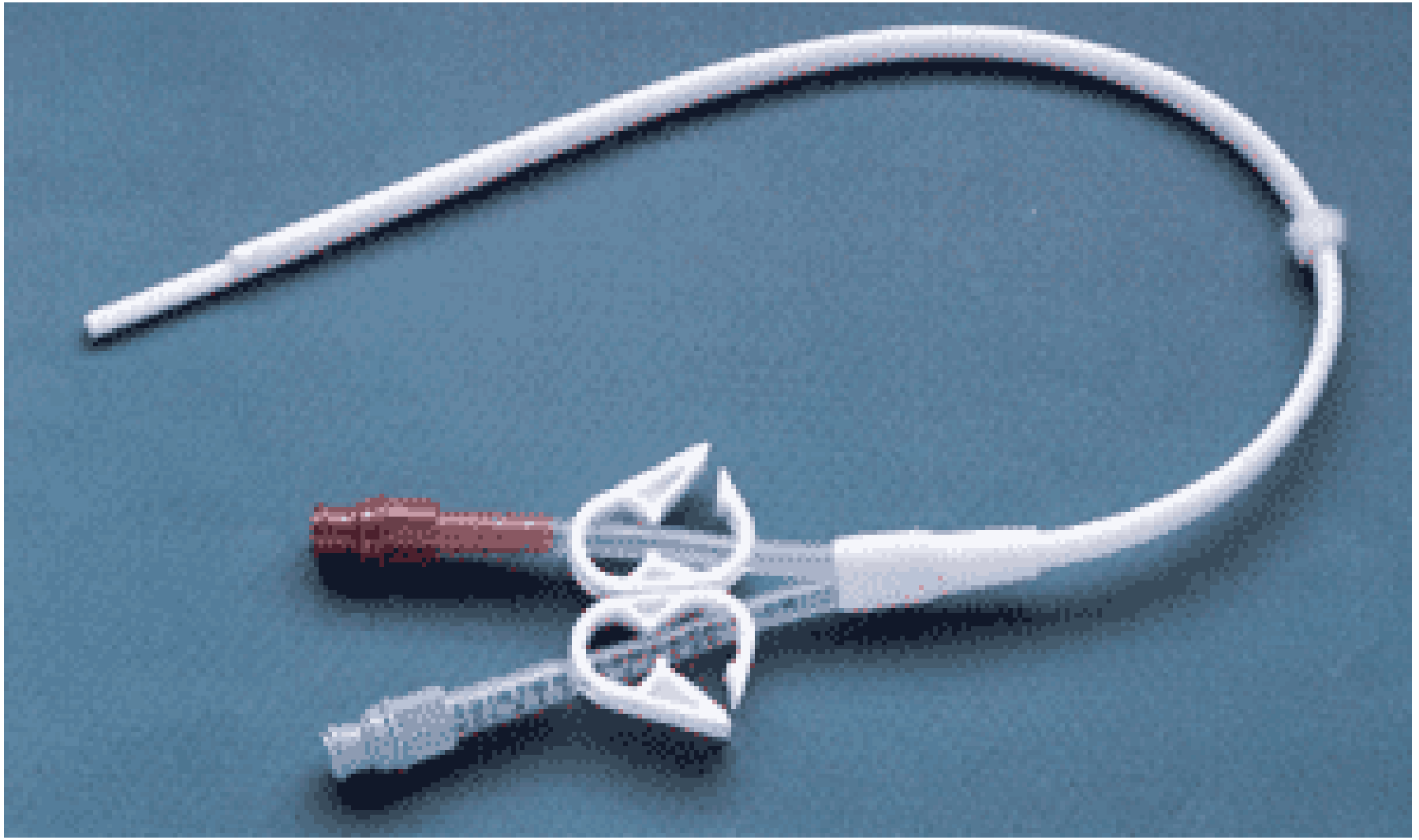


Diameter : 11.5 Fr

Length : 13.5 , 16 , 19 , 20 cms

Catheter for hemodialysis

- Cuffed tunnel hemodialysis catheter
  - Blunt-tipped , soft catheter made from silicone
  - Contain Dacron cuff induce tissue incorporate
    - prevent catheter dislodge
    - prevent infection

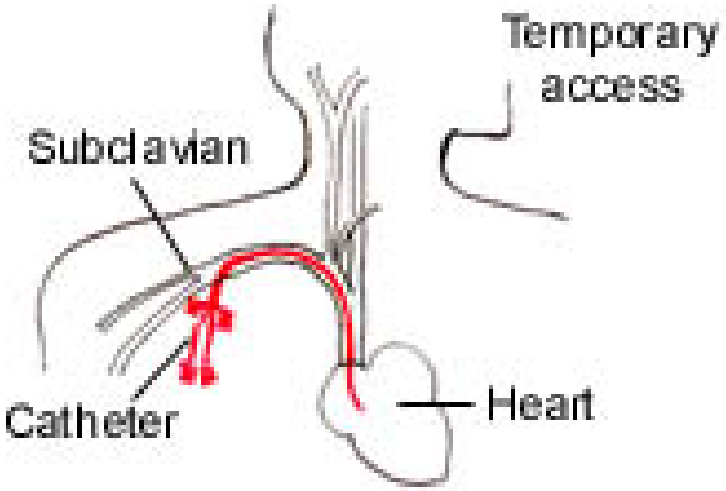


Diameter ： 12.5 , 14.5 Fr

Length ： 24 , 28 , 32 cms


OASH
SPLIT CATH II

Subclavian catheter



Internal jugular catheter