ERECTILE DYSFUNCTION

İSTANBUL ALTINBAŞ ÜNİVERSİTESİ 10. Yıl

Kemerburgaz adıyla doğduk, Altınbaş adıyla büyüyoruz

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Agenda

- 1-Anatomy and physiology of erection.
- 2-Definition and prevalence of E.D
- 3-Causes of E.D
- 4-Evaluation of E.D
- 5-Treatment of E.D

Anatomical background

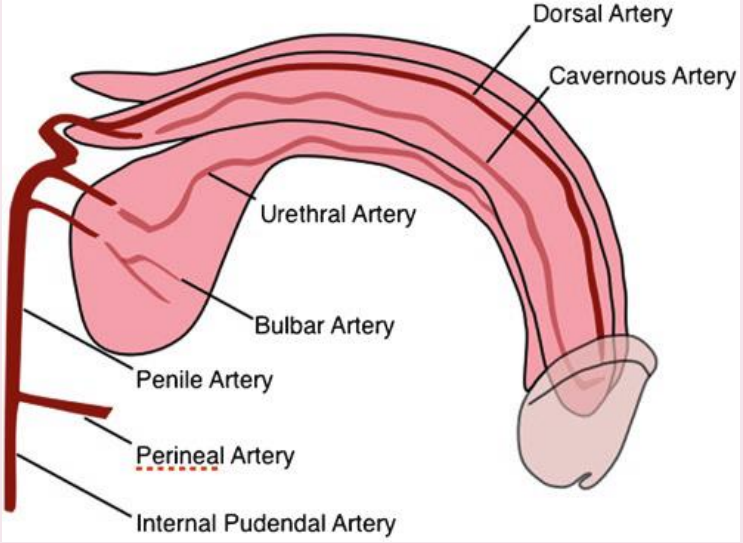
BLOOD SUPPLY

- The internal pudendal artery

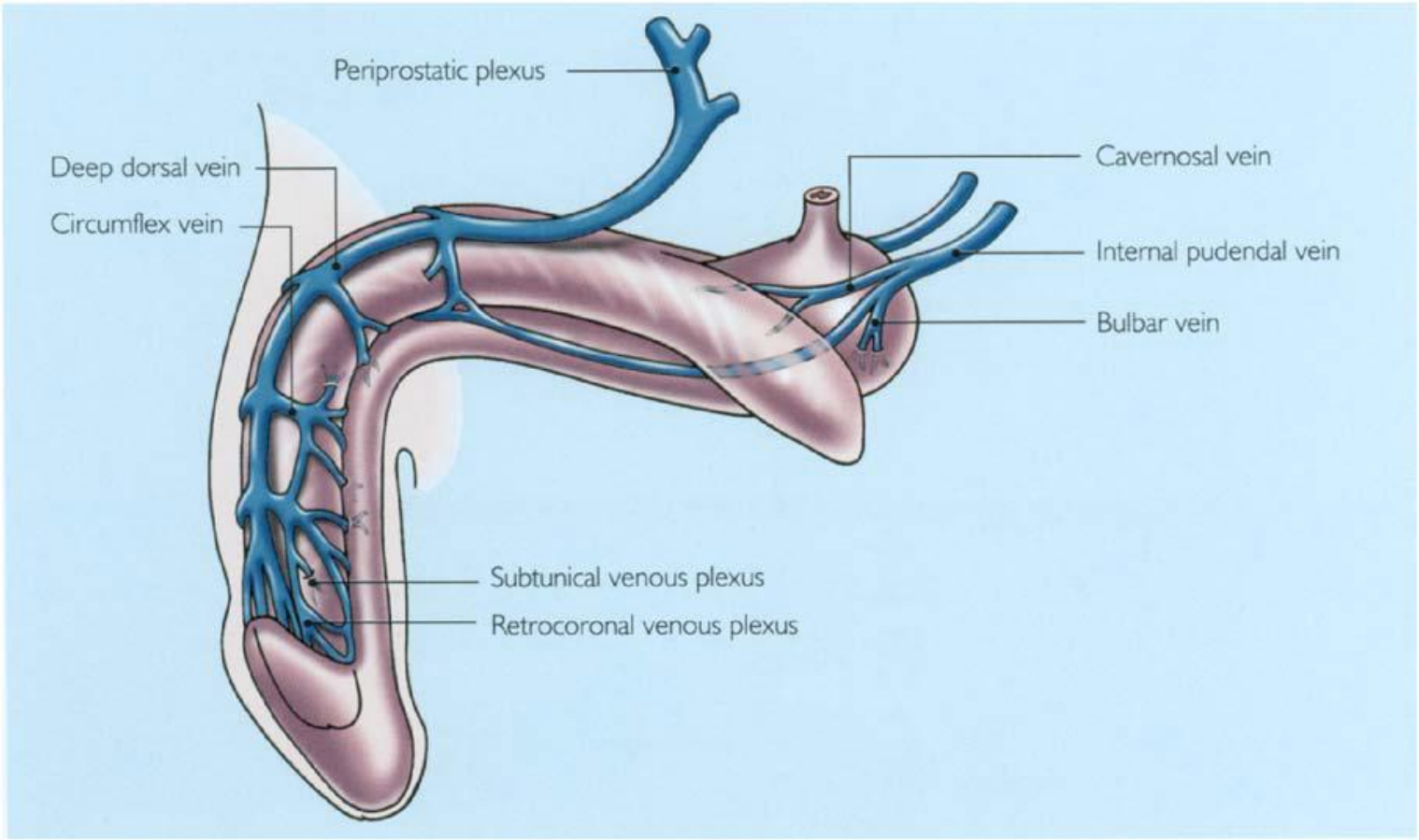
  forms the penile artery after giving of the perineal artery. The penile artery has paired four terminal branches:

- Bulbar
- Cavernous (deep penile)
- Dorsal artery
- Urethral

Penile blood supply is bilaterally symmetrical



VENOUS DRAINAGE

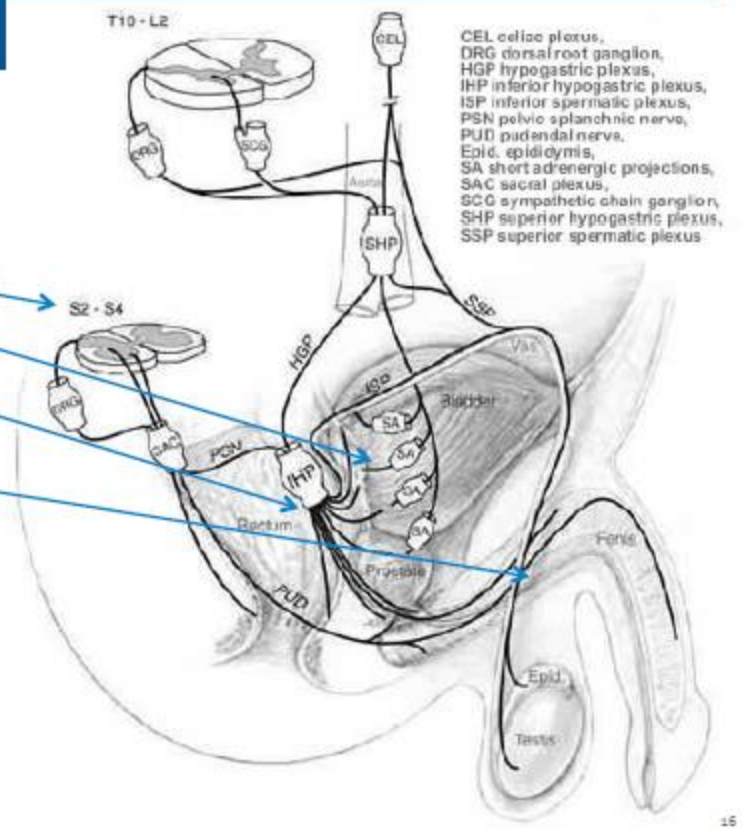


PENILE INNERVATION

- Penile innervation:
  - Autonomic
    - Parasympathetic:

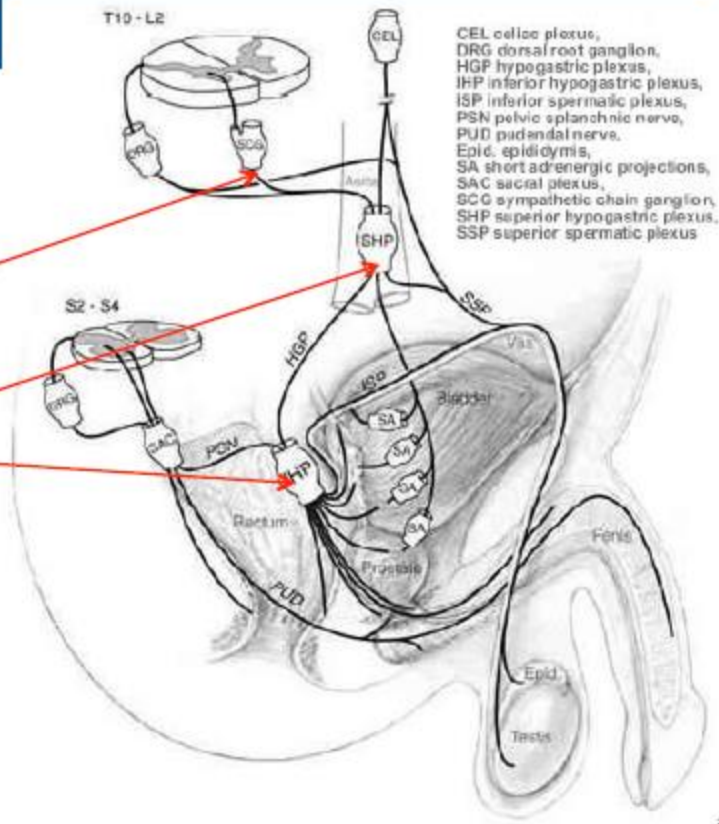
Intermediolateral cell columns of S2 – 4 ➔ Pelvic nerves ➔ Pelvic plexus ➔ Join sympathetic nerves from superior hypogastric plexus ➔ Cavernous nerves ➔ Penis

- Stimulation of **pelvic plexus** and **cavernous nerves** induces **erection**

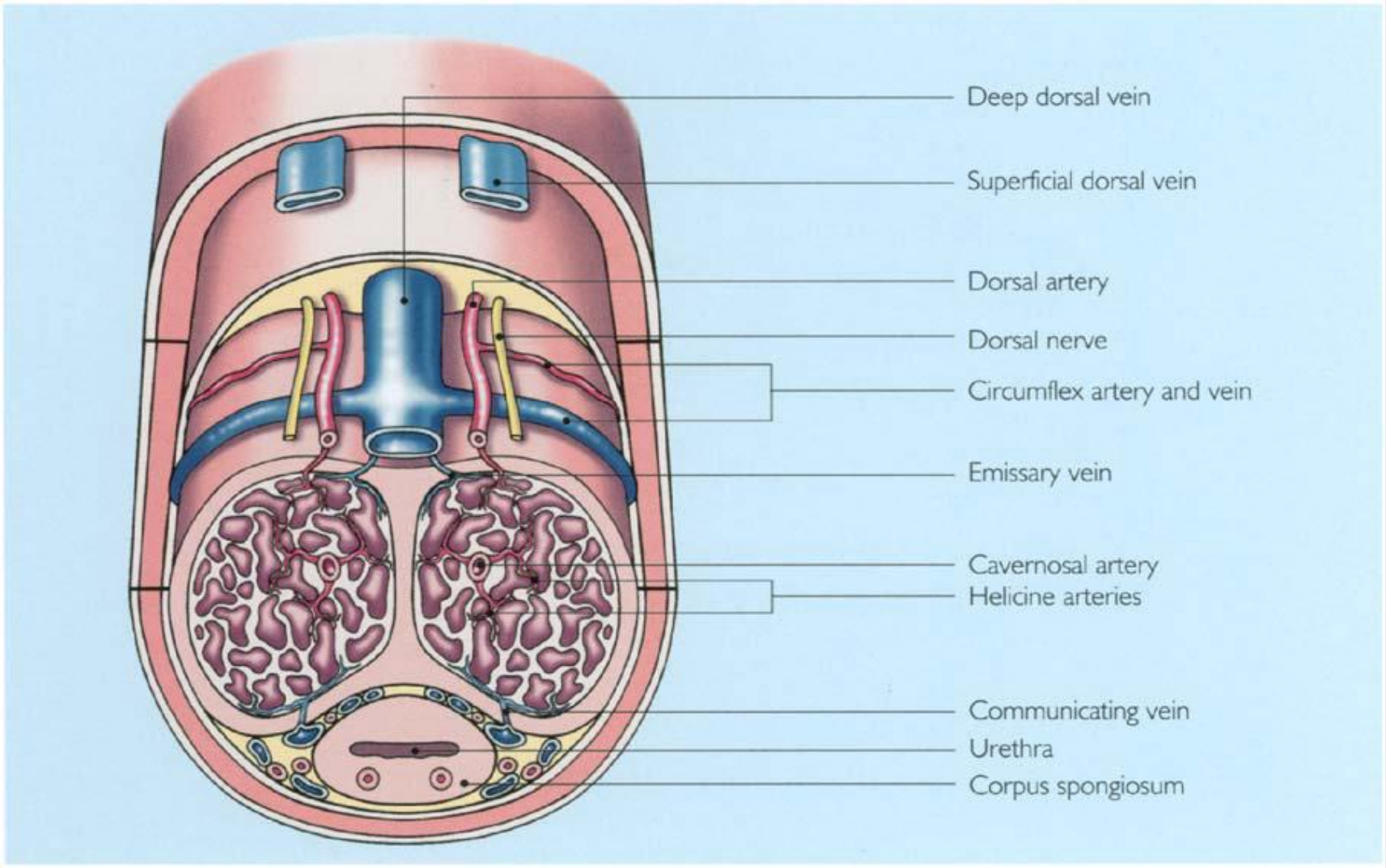


PENILE INNERVATION

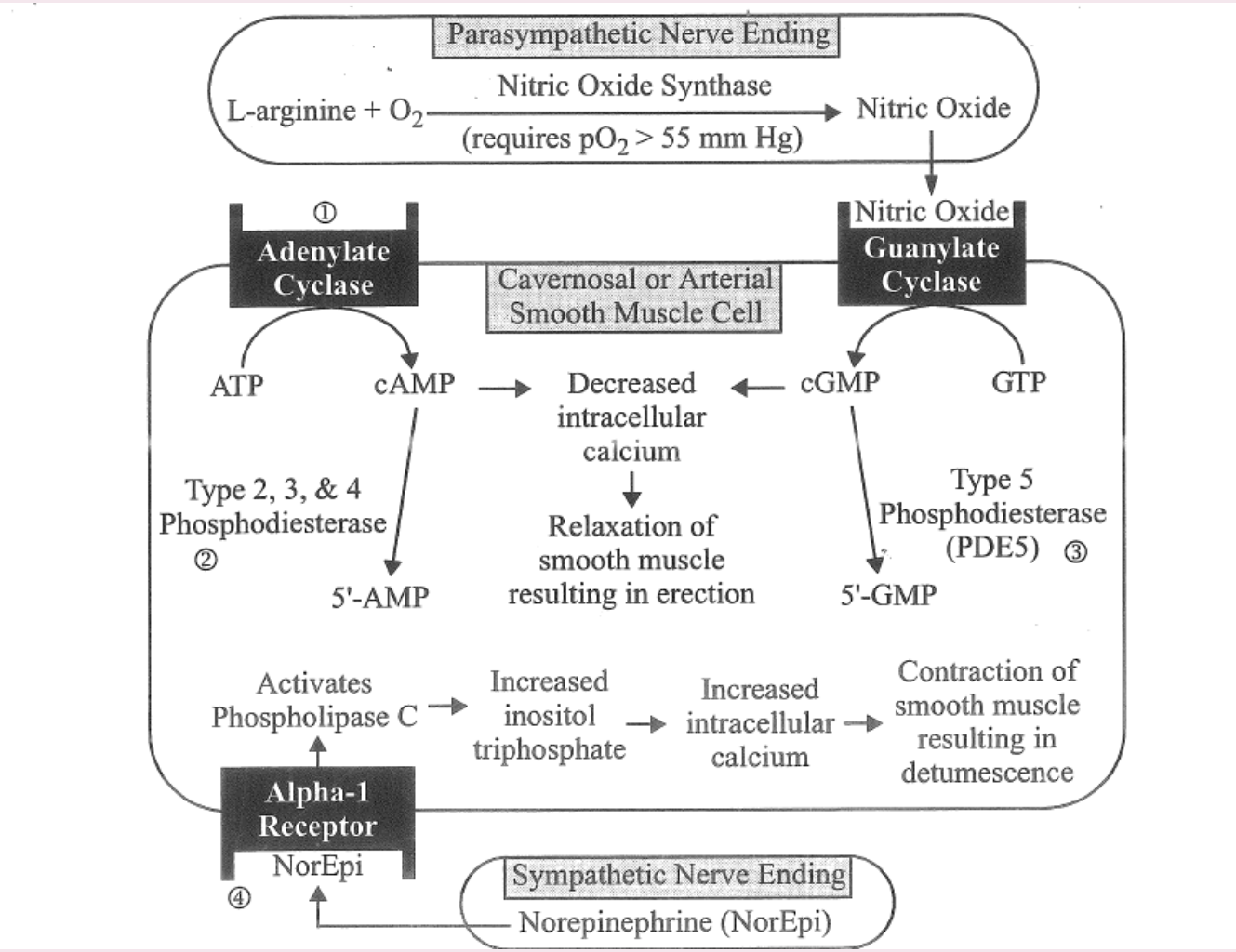
- Penile innervation:
  - Autonomic
    - Sympathetic: T10 – L2 ➔ White rami ➔ Sympathetic chain ganglia ➔ Lumbar splanchnic nerves ➔ Inferior mesenteric and superior hypogastric plexuses ➔ Hypogastric nerves ➔ Pelvic plexus
    - Stimulation of **sympathetic trunk** causes **ejaculation and detumescence**



CROSS-SECTION OF THE PENIS



PHYSIOLOGY OF ERECTION



PHYSIOLOGY OF ERECTION

- Intact nerves (somebody to start the air flow)
- Good blood flow to the penis (working compressor tubing)
- Intact/healthy cavernosal tissue (a good tire)
- The ability to block venous output from the penis (no leak in the tire)

ERECTILE DYSFUNCTION

Persistent inability to attain and/or maintain an erection sufficient to permit satisfactory sexual performance.

(NIH consensus conference on impotence1993 and AUA Guidline)

PREVALENCE

- Massachusetts Male Aging Study (MMAS)
- Prevalence –
  - Men 40-70yrs
    - 52% have ED
    - Mild ED: 17%
    - Moderate ED : 25%
    - Complete ED : 10%
- ED prevalence increases with age
  - 50% at age 50, 60% at age 60, 70% at age 70

RISK FACTORS FOR E .D

E.D share the same risk factors of cardiovascular disease:

- Lack of exercise,
- Obesity,
- Smoking,
- Hypercholesterolemia
- The metabolic syndrome

Vasculogenic
- Cardiovascular disease
- Hypertension
- Diabetes mellitus
- Hyperlipidaemia
- Smoking
- Major surgery (radical prostatectomy) or radiotherapy (pelvis or retroperitoneum)
Neurogenic
Central causes
- Multiple sclerosis
- Multiple atrophy
- Parkinson's disease
- Tumours
- Stroke
- Disk disease
- Spinal cord disorders
Peripheral causes
- Diabetes mellitus
- Alcoholism
- Uraemia
- Polyneuropathy
- Surgery (pelvis or retroperitoneum, radical prostatectomy)
Anatomical or structural
- Peyronie's disease
- Penile fracture
- Congenital curvature of the penis
- Micropenis
- Hypospadias, epispadias
Hormonal
- Hypogonadism
- Hyperprolactinemia
- Hyper- and hypo-thyroidism
- Cushing's disease
Drug-induced
- Antihypertensives (diuretics and beta-blockers are the most common causes)
- Antidepressants
- Antipsychotics
- Antiandrogens
- Antihistamines
- Recreational drugs (heroin, cocaine, methadone)
Psychogenic
- Generalised type (e.g. lack of arousability and disorders of sexual intimacy)
- Situational type (e.g. partner-related, performance-related issues or due to distress)

ETIOLOGY

1) **Psychogenic.**
2) **Vasculogenic :**
   - Cardiovascular disease
   - Hypertension
   - Diabetes mellitus
   - Major surgery or radiotherapy (pelvis or retroperitoneum).

ETIOLOGY

3) **Neurogenic**

Central causes

- Multiple sclerosis
- Parkinson's disease
- Tumors
- Stroke
- Spinal cord disorders(disc disease)

Peripheral causes

- Diabetes mellitus
- Alcoholism
- Polyneuropathy
- Surgery (pelvis or retroperitoneum).

ETIOLOGY

4) **Anatomical / structural**
   - Peyronie’s disease
   - Penile fracture
   - Congenital curvature of the penis
5) **Hormonal**
   - Hypogonadism
   - Hyperprolactinemia
   - Hyper-and hypothyroidism
   - Cushing's disease.

ETIOLOGY

6) **Drug-induced**

- Antihypertensives (beta-blocker,thiazide and clonidine .less with ACE inhibitors)
- Antidepressants (tricyclic antidepressants and MAO inihibitor)
- Antipsychotics
- Antiandrogens
- Antihistamines
- Recreational drugs (Heroin and cocaine)

EVALUATION

Medical,surgical,psychological,social,truama and medication history.

Sexual history

- Sexual relationships ,
- Current emotional status
- Onset and duration of the erectile problem
- Previous treatments.
- Erotic and morning erections in terms of rigidity and duration. .
- The use of validated questionnaires such as the International Index for Erectile Function (IIEF).

Patient Name: _____ **MR#:** _____ **Date:** _____

OVER THE PAST 4 WEEKS

1. How often were you able to get an erection during sexual activity?
   0 = No sexual activity
   1 = Almost never/never
   2 = A few times (much less than half the time)
   3 = Sometimes (about half the time)
   4 = Most times (much more than half the time)
   5 = Almost always/always

2. When you had erections with sexual stimulation, how often were your erections hard enough for penetration?
   0 = No sexual activity
   1 = Almost never/never
   2 = A few times (much less than half the time)
   3 = Sometimes (about half the time)
   4 = Most times (much more than half the time)
   5 = Almost always/always

3. When you attempted sexual intercourse, how often were you able to penetrate (enter)?
   0 = Did not attempt intercourse
   1 = Almost never/never
   2 = A few times (much less than half the time)
   3 = Sometimes (about half the time)
   4 = Most times (much more than half the time)
   5 = Almost always/always

4. During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) you partner?
   0 = Did not attempt intercourse
   1 = Almost never/never
   2 = A few times (much less than half the time)
   3 = Sometimes (about half the time)
   4 = Most times (much more than half the time)
   5 = Almost always/always

5. During sexual intercourse, how difficult was it to maintain your erection to complete intercourse?
   0 = Did not attempt intercourse
   1 = Extremely difficult
   2 = Very difficult
   3 = Difficult
   4 = Slightly difficult
   5 = Not difficult

6. How many times have you attempted sexual intercourse?
   0 = No attempts
   1 = One to two attempts
   2 = Three to four attempts
   3 = Five to six attempts
   4 = Seven to ten attempts
   5 = Eleven or more attempts

7. When you attempted sexual intercourse, how often was it satisfactory to you?
   0 = Did not attempt intercourse
   1 = Almost never/never
   2 = A few times (much less than half the time)
   3 = Sometimes (about half the time)
   4 = Most times (much more than half the time)
   5 = Almost always/always

8. How much have you enjoyed sexual intercourse?
   0 = No intercourse
   1 = No enjoyment
   2 = Not very enjoyable
   3 = Fairly enjoyable
   4 = Highly enjoyable
   5 = Very highly enjoyable

9. When you had sexual stimulation or intercourse, how often did you ejaculate?
   0 = No sexual stimulation/intercourse
   1 = Almost never/never
   2 = A few times (much less than half the time)
   3 = Sometimes (about half the time)
   4 = Most times (much more than half the time)
   5 = Almost always/always

10. When you had sexual stimulation or intercourse, how often did you have the feeling of orgasm or climax?
    0 = No sexual stimulation/intercourse
    1 = Almost never/never
    2 = A few times (much less than half the time)
    3 = Sometimes (about half the time)
    4 = Most times (much more than half the time)
    5 = Almost always/always

11. How often have you felt sexual desire?
    1 = Almost never/never
    2 = A few times (much less than half the time)
    3 = Sometimes (about half the time)
    4 = Most times (much more than half the time)
    5 = Almost always/always

12. How would you rate your level of sexual desire?
    1 = Very low/none at all
    2 = Low
    3 = Moderate
    4 = High
    5 = Very high

13. How satisfied have you been with your overall sex life?
    1 = Very dissatisfied
    2 = Moderately dissatisfied
    3 = About equally satisfied and dissatisfied
    4 = Moderately satisfied
    5 = Very satisfied

14. How satisfied have you been with your sexual relationship with your partner?
    1 = Very dissatisfied
    2 = Moderately dissatisfied
    3 = About equally satisfied and dissatisfied
    4 = Moderately satisfied
    5 = Very satisfied

15. How do you rate your confidence that you could get and keep an erection?
    1 = Very low
    2 = Low
    3 = Moderate
    4 = High
    5 = Very high

EVALUATION

Physical examination

- Examination of the genitourinary, endocrine, vascular and neurological systems.
- A rectal examination in every patient older than 50 years.
- Blood pressure and heart should be measured

EVALUATION

Laboratory testing

Basic lab. Tests done for all patients

- Fasting blood glucose
- Lipid profile
- morning sample of total testosterone.

EVALUATION

Specialized diagnostic tests

- Nocturnal penile tumescence and rigidity
- Vascular studies
  - Intracavernous vasoactive drug injection
  - Duplex ultrasound

There is no need to continue vascular investigation when the duplex examination is normal

  - Dynamic cavernosometry or cavernosography
  - Internal pudendal arteriography

For patients who are candidates for vascular reconstructive surgery

- Neurological studies (e.g. bulbocavernosus reflex latency).
- Endocrinological studies

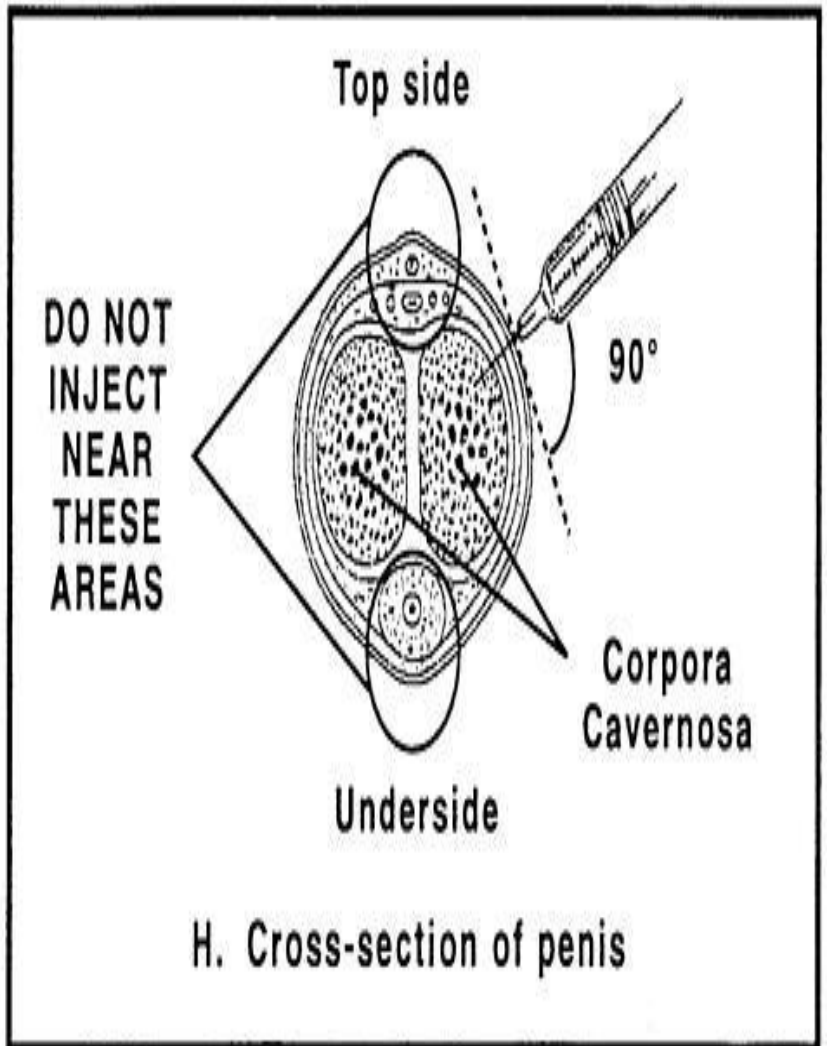
NOCTURNAL PENILE TUMESCENCE AND RIGIDITY

NOCTURNAL PENILE TUMESCENCE AND RIGIDITY

- NPTR distinguish Psychogenic E.D from organic E.D

- The nocturnal penile tumescence and rigidity assessment should be done on at least two nights.

INTRACAVERNOUS DRUG INJECTION



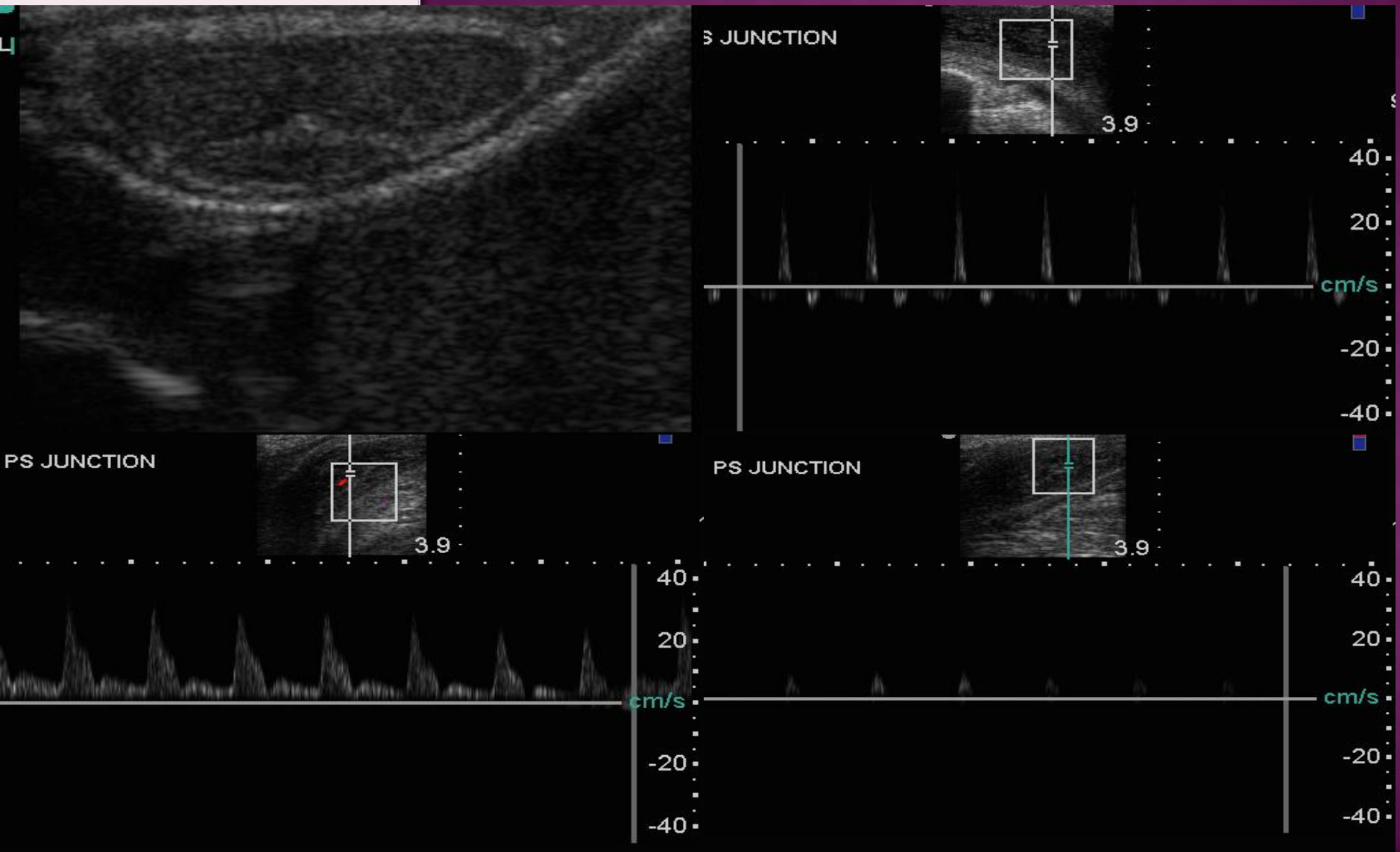
INTRACAVERNOUS DRUG INJECTION

- A positive test is a rigid erectile response (unable to bend the penis) that appears within 10 min after the intracavernous injection and lasts for 30 min .

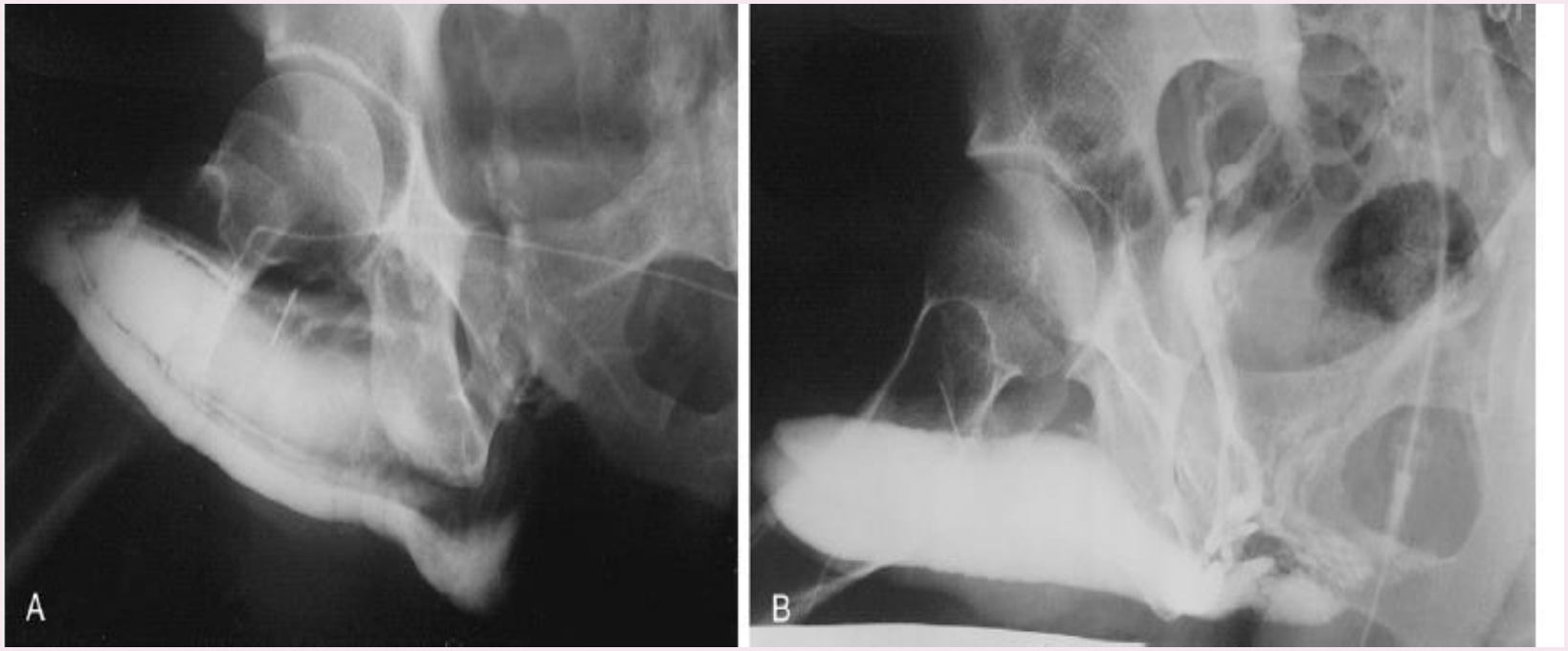
  (Meuleman EJ and Diemont WL 1995).

- A good erection rule out veno-occlusive disease.
- Poor erection:-veno-occlusive disease
  -arterial insufficiency
  -anxiety
  -inadequate dose

DUPLEX ULTRASOUND



DYNAMIC CAVERNOSOGRAPHY



PRINCIPLES OF TREATMENT:

- The primary goal in the management strategy of a patient with ED is to determine the aetiology of the disease and treat it when possible, and not to treat the symptom alone.
- modifiable or reversible factors, including lifestyle or drug-related factors should be modified first.
- As a rule, ED can be treated successfully but cannot be cured. The only exceptions are psychogenic ED, post-traumatic arteriogenic ED in young patients, and hormonal causes

TREATMENT

1-lifestyle modification

2-Treatment of curable E.D

3-Therapy for assisted erection

First -line therapy

Oral drugs (PDE5 and Apomorphine)

Topical pharmacotherapy

Intraurethral alprostadil (MUSE)

Second -line therapy

Vacuum constriction devices

Intracavernous injections

Third -line therapy

Penile prosthesi

1-LIFESTYLE MODIFICATION

- Avoid smoking
- Maintain ideal body weight
- Regular exercise
- Stop alcohol abuse
- Consider alternative for medication that contriute to E.D
- Optimize management of D.M,HTN and heart diseases

CURABLE CAUSES OF E.D

- 1-Hormonal:

Testosterone replacement therapy (intramuscular, oral, or transdermal) is effective, but should only be used after other endocrinological causes for testicular failure have been excluded.

(Greenstein et al 2005)

CURABLE CAUSES OF E.D

- *2-Post-traumatic arteriogenic ED in young patients:*

- In young patients with pelvic or perineal trauma, surgical penile revascularisation has a 60-70% long-term success rate

(Rao DS and Donatucci CF ,2001) .

- Vascular surgery for veno-occlusive dysfunction is no longer recommended because of poor long-term results

(Wespes E et. Al 2003)

CURABLE CAUSES OF E.D

3 ***Psychosexual counselling*** **:**

- For patients with a significant psychological problem, psychosexual therapy may be given either alone or with another therapy for assisted erection.

THERAPY FOR ASSISTED ERECTION

First line theray:

PDE 5 inhibitors:

Oral phosphodiesterase type 5 inhibitor that prolongs the relaxant effect of NO in penile smooth muscle

PDE 5 INHIBITORS

Adverse events

- Headache, Flushing, Dyspepsia, Nasal congestion and Dizziness
- Abnormal vision with Sildenafil and Vardenafil only.
- Back pain and Myalgia with Tadalafil only.

Generic name	Brand name	Effect of fatty meal	T max (hours)	T½ hours	Duration of action (hours)	Start dose (mg)	Dose range (mg)
Sildenafil	Viagra	Yes	1	4	6-8	50	25-100
vardenafil	Levitra	Yes	1	4-5	6-8	10	5-20
Tadalafil	cialis	NO	2	17.5	24-36	10	5-20

PDE 5 INHIBITORS

- Drug interaction:

  1- Nitrates:

  totally contraindicated with PDE5 inhibitors

  2- Antihypertensive drugs:

  Co-administration of PDE5 inhibitors with antihypertensive agents may result in small additive drops in blood pressure, which are usually minor.

Alpha blocker:

PDE 5 inhibitor should be used with caution with alpha blocker for fear of profound hypotension

OTHER ORAL THERAPY

1- ***Apomorphine sublingual***

- centrally acting dopamine agonist .
- Nausea in 1/8 men.
- not FDA approved

2-**Yohimbine hydrochloride**

- centrally and peripherally active alpha-2 adrenergic antagonist
- HTN,anxiety,tachycardia,headache
- No better than placebo In blinded studies

OTHER ORAL THERAPY

3-Trazodone:

serotonin reuptake inhibitor (antidepressant) associated with prolonged erections and priapism.

4-Others:

- L-arginine
- Limaprost(PGE 1)
- Oral phentolamine :under trial

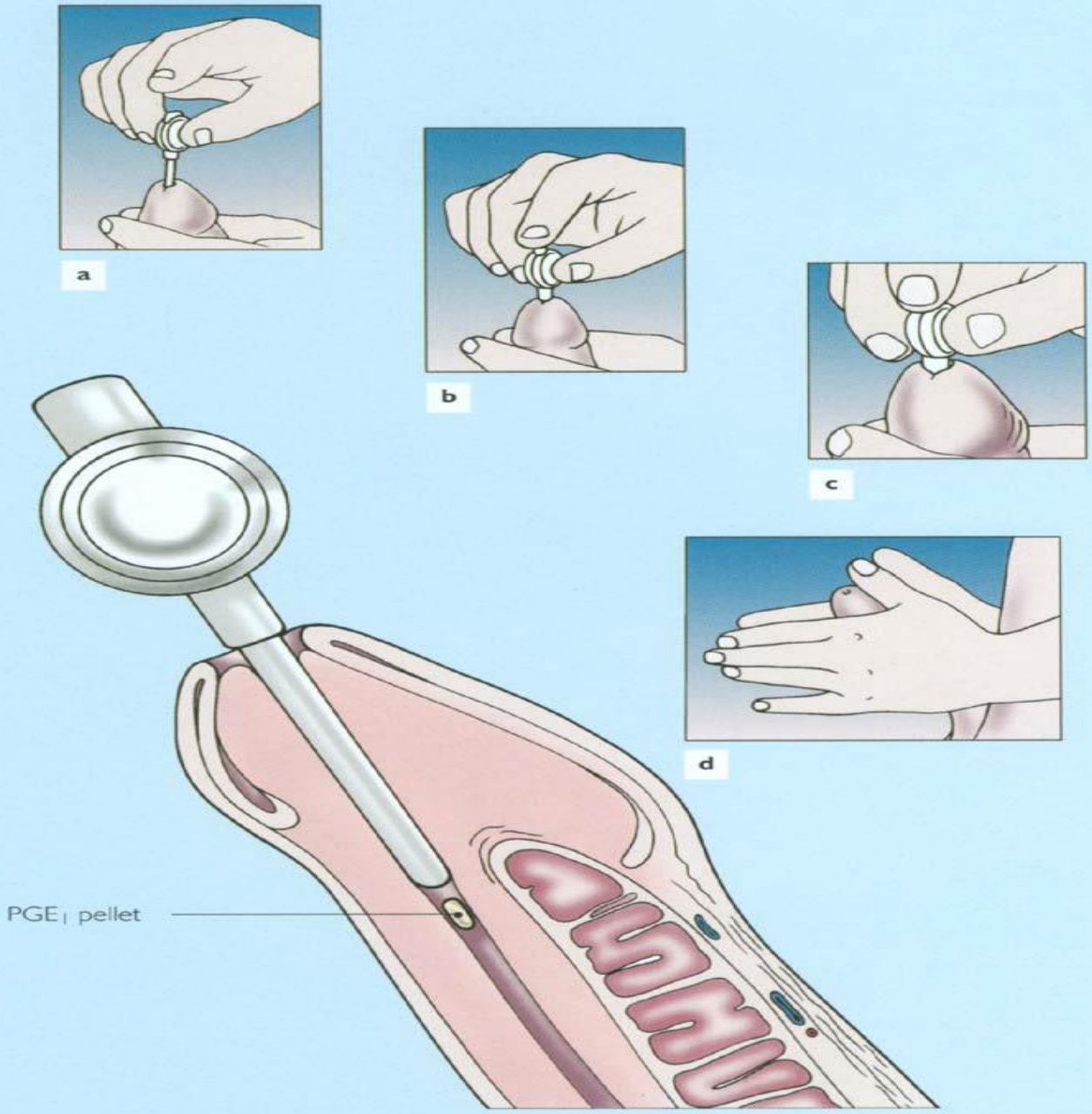
TOPICAL PHARMACOTHERAPY

- No topical therapy has been approved and currently these agents have no role in treatment of ED.

(EUA Guidelines 2009)

MEDICATED URETHRAL SYSTEM FOR ERECTION(MUSE):

- Intraurthral alprostadil (PGE1)
- Introduced in 1990
- Mechanism:activate adenylate cyclase
- Erection starts 5-20 min after administration
- Contraindication: distal urethral stricure
  significant angulation or fibrosis
  balanitis or urethritis
  sexual activity with pregnant female
- Side effects: pain,bleeding,priapism and hypotension


a
b
c
d
PGE1 pellet

INTRACAVERNOUS INJECTION

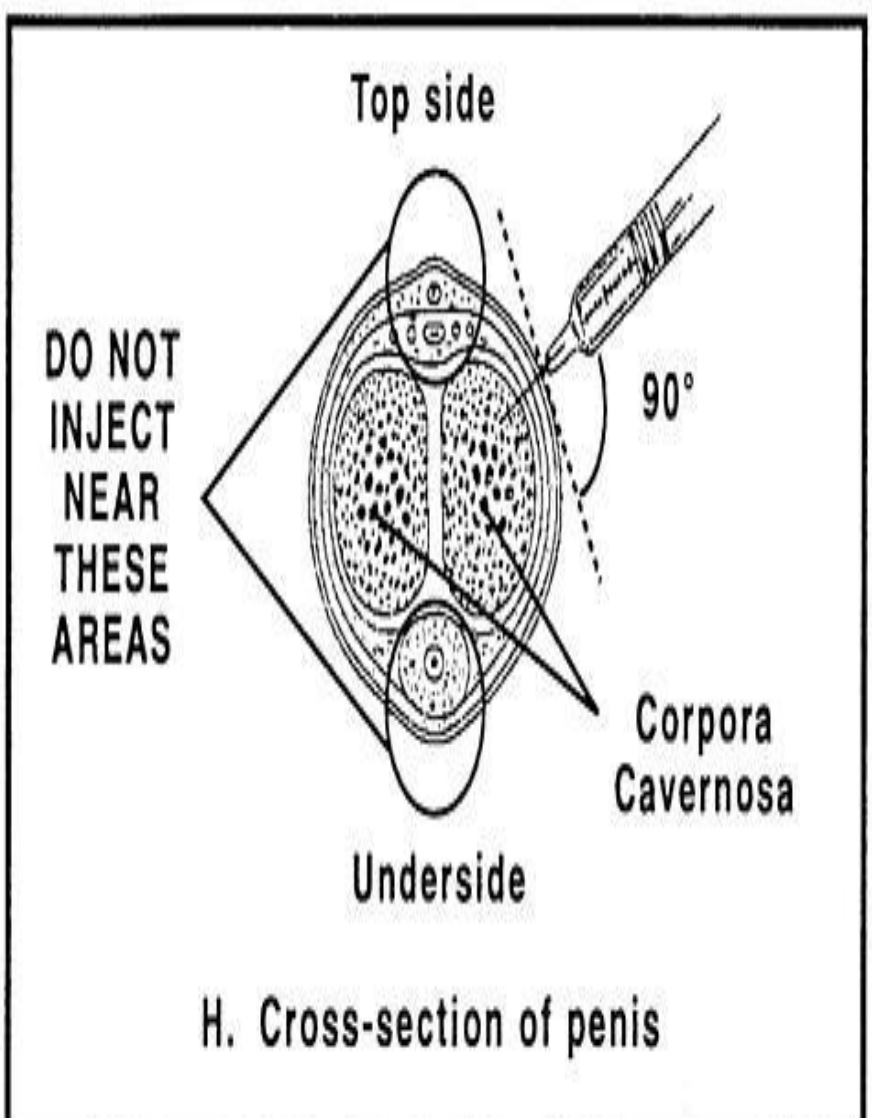
- Introduced in 1980
- 3 main components used singly or in combination:

  1- PGE1–only FDA approved

  2-Papaverine :non-specific PDE inhibitor

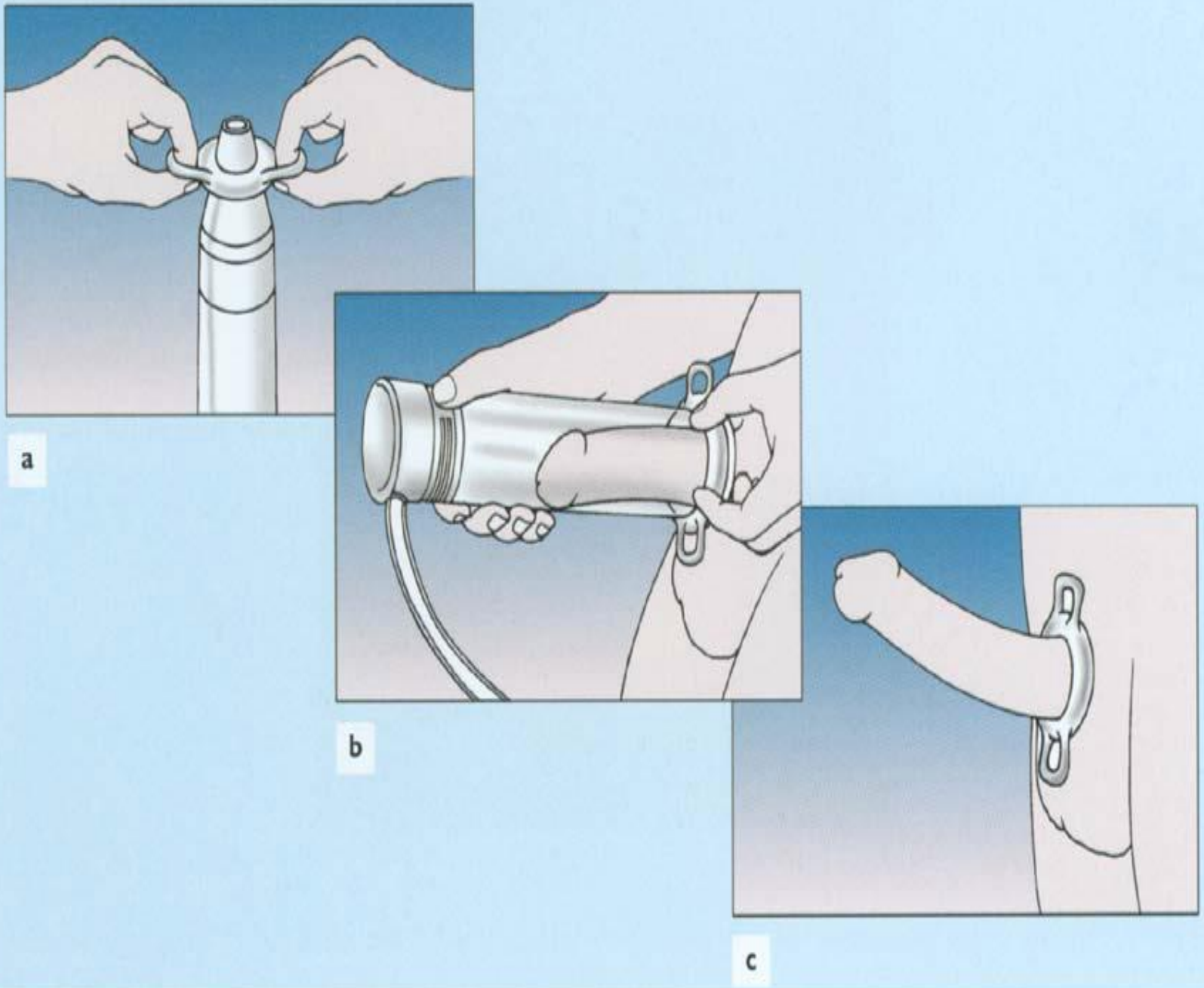
  3- Phentolamine α-adrenergic receptor antagonist (not used alone)
- Side effects:priapism, fibrosis (less with PGE1) ,pain (less with papaverine), and hypotension

INTRACAVERNOUS DRUG INJECTION



VACUUM CONSTRICTION DEVICES

- Mechanically create negative pressure surrounding penis
- Engorge penis with blood
- Ring to prevent venous leakage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PENILE PROTHESIS

- The third line therapy after failure of other lines.
- Has the the highest satisfaction rates (70-87%) among treatment options for ED .

(EUA Guidelines 2009)

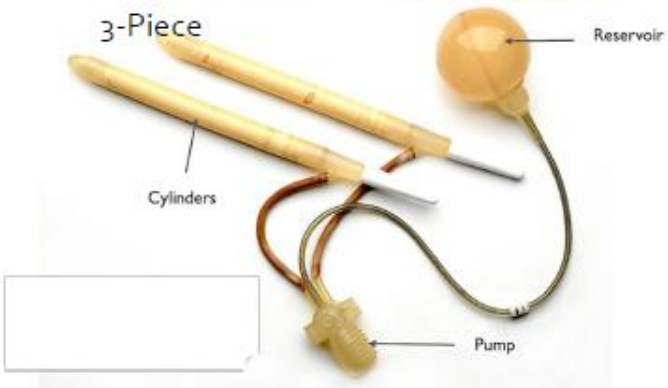
- The two main complications of penile prosthesis implantation are *mechanical failure* and ***infection***.

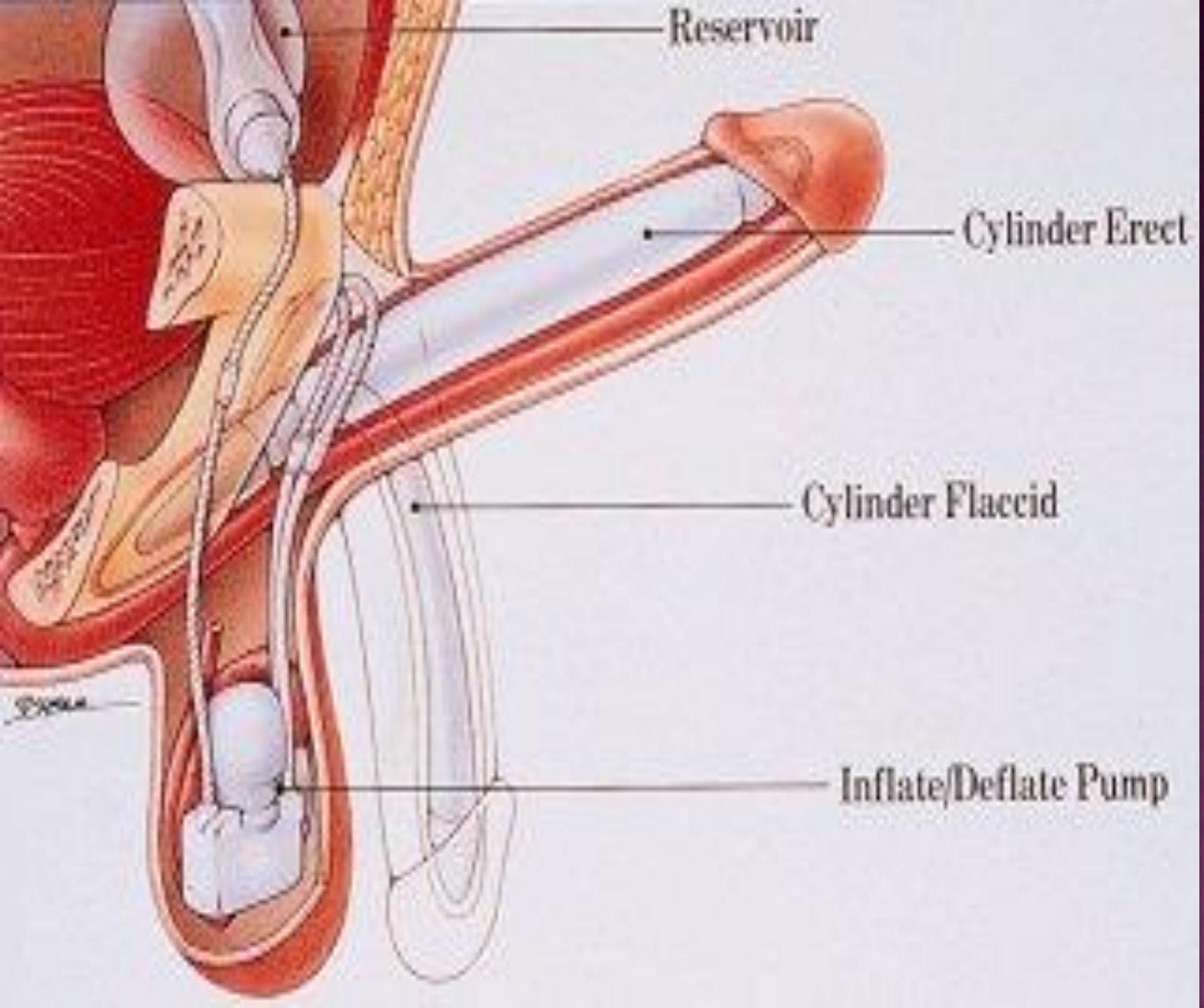
Penile Prosthesis

Malleable

2-Piece

3-Piece




Reservoir
Cylinder Erect
Cylinder Flaccid
Inflate/Deflate Pump