



Dysfonction érectile : point de vue de l'angiologie

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Aucun conflit d'intérêt



Au programme

- Un peu d'épidémiologie
- Anatomie pénienne et physiologie de l'érection
- Dysfonction érectile et maladies cardio-vasculaires
- Approche clinique initiale
- Traitements courants
- Investigations approfondies
- Traitements alternatifs
- Interventions et chirurgies
- Conclusions

C'est quoi la dysfonction érectile ?

~~Impotence~~

JAMA, July 7, 1993—Vol 270, No. 1

NIH Consensus Development Panel on Impotence

THE TERM *impotence*, as it has been applied to the title of this conference, has traditionally been used to signify the inability of the male to attain and maintain erection of the penis sufficient to permit satisfactory sexual intercourse. However, this use has often led to confusing and uninterpretable results in clinical and basic science investigations. This, together with its pejorative implications, suggests that the more precise term *erectile dysfunction* be used instead to signify an inability of the male to achieve an erect penis as

Incapacité permanente ou partielle d'obtenir ou de maintenir une rigidité pénienne suffisante pour permettre une activité sexuelle satisfaisante.

Est-ce fréquent ?

1994	Feldman <i>et al.</i> [3] *MMAS	1,290 men; random population sample (United States)	40%	40-70	Self-administered questionnaire	Overall, 52% of men had ED 17.2% of men had minimal ED 25.2% of men had moderate ED 9.6% of men had complete ED	Age
2000	Braun <i>et al.</i> [10] (COLOGNE Study)	8,000 men	56%	30-80	Self-administered questionnaire by mail (Cologne ED Questionnaire)	Prevalence of ED was 19.2%	Age, Hypertension, Diabetes, Pelvic surgery, LUTS
2010	Corona <i>et al.</i> [33]	3,369 men; random population study (Europe: Italy, Belgium, United Kingdom, Spain, Poland, Hungary, Estonia)	40%	40-80	Self-administered questionnaire	Overall, 30% of men had ED 6% ED in men aged 40–49 years 19% ED in men aged 50–59 years 38% ED in men aged 60–69 years 64% ED in men ≥ 70 years	Age, Depression, LUTS, Cardiovascular disease, Diabetes, Obesity

Incidence estimée à environ 2%



Méthodologies et populations étudiées différentes

Et chez les plus jeunes ?

1836

Capogrosso et al.

Table 1 Descriptive statistics in ≤ 40 years old and > 40 years old ED patients (No. = 439)

	Patients ≤ 40 years	Patients > 40 years	P value*
No. of patients (%)	114 (25.9)	325 (74.1)	
Age (years; mean [SD])	32.4 (6.0)	57.1 (9.7)	< 0.001
Range	17–40	41–77	
CCI (No. [%])			< 0.001 (χ^2 , 39.12)
0	103 (90.4)	189 (58.3)	
1	6 (5.3)	62 (19)	
2+	5 (4.4)	74 (22.7)	
BMI (kg/m ² ; mean [SD])	25.1 (4.1)	26.4 (3.7)	0.005
BMI (NIH classification) (No. [%])			0.002 (χ^2 , 15.20)
< 18.5	1 (0.9)	0 (0)	

Table 3 IIEF-domain scores and rates of ED severity in ≤ 40 years old and > 40 years old ED patients (No. = 439)

IIEF-domains (mean [SD])	Patients ≤ 40 years	Patients > 40 years	P value*
IIEF EF	12.77 (8.7)	14.67 (8.4)	0.23

2021	Calzo et al. [37]	2,660 sexually active men (USA)	Not reported	18–31	Self-administered questionnaire (IIEF-5)	Prevalence of mild ED was 11.3% and moderate-to-severe ED was 2.9%	Demographic (age; marital status) Metabolic (body mass index; waist circumference; history of diabetes, hypertension, hypercholesterolaemia) Mental health (depression, anxiety, antidepressant, tranquiliser use)
Sexual orientation (No. [%])							
Heterosexual			109 (95.6)		322 (99.1)		Moderate ED
Homosexual			5 (4.4)		3 (0.9)		Severe ED
Relationship status (No. [%])						< 0.001 (χ^2 , 27.51)	
Stable sexual relationship ≥ 6 months			81 (71.4)		303 (93.2)		
No stable sexual relationship			33 (28.6)		22 (6.8)		
Educational status (No. [%])						0.05 (χ^2 , 9.30)	
Elementary school			0 (0)		22 (6.8)		
Secondary school			20 (17.5)		64 (19.7)		
High school			51 (44.7)		141 (43.4)		
University degree			43 (37.7)		98 (30.2)		
Concomitant sexual complaints (No. [%])							
PE			14 (12.4)		20 (6.2)	0.03 (χ^2 , 4.55)	
Low libido			10 (8.8)		23 (7.1)	0.55 (χ^2 , 0.35)	
Peyronie's disease			5 (4.4)		37 (11.4)	0.03 (χ^2 , 4.78)	

Keys: SD = standard deviation; CCI = Charlson Comorbidity Index; BMI = body mass index; NIH = National Institutes of Health; MeTs = metabolic syndrome;

TT = total testosterone; PE = premature ejaculation

*P value according to χ^2 test or two-tailed independent t-test, as indicated

Moderate ED 21 (16.6) 48 (14.9)
Severe ED 56 (48.8) 132 (40.6)

Keys: IIEF = International Index of Erectile Function; EF = Erectile Function domain; IS = intercourse satisfaction domain; OF = orgasmic function domain; SD = sexual desire domain; OS = overall satisfaction domain; ED = erectile dysfunction

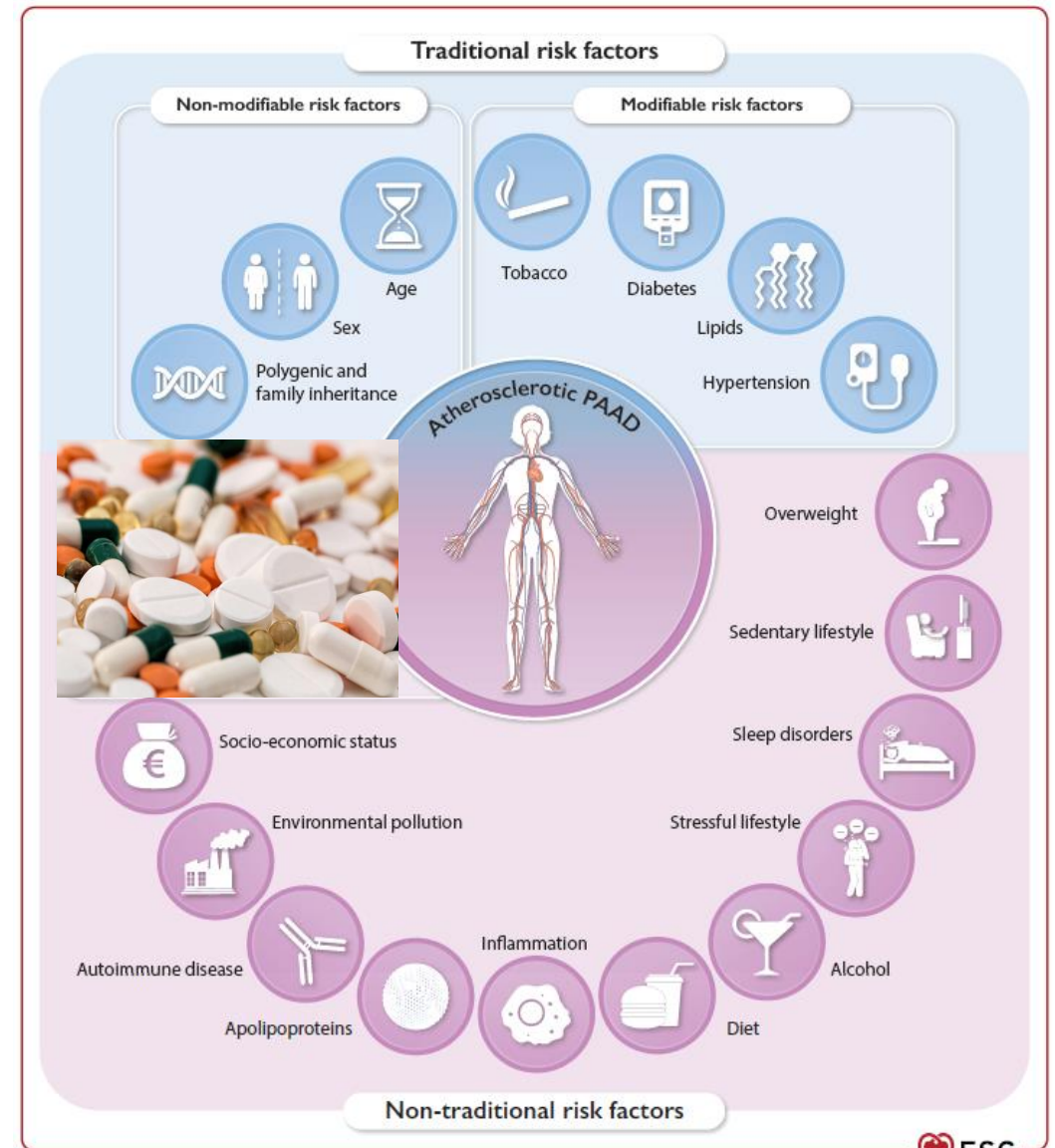
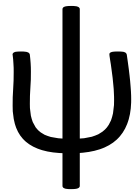
*P value according to two-tailed Student's t-test or χ^2 test, as indicated

†ED severity was categorized according to the classification suggested by Cappelleri et al. [23].

Facteurs de risque

Conclusion: The review provides summary estimates for 37 risk factors and 28 treatments. Meta-analyses of risk factors often did not control for important confounders, and meta-analyses of randomized trials were not exclusive to double-blinded trials, active placebo controls, or tests of long-term effects. We recommend further meta-analyses that eliminate lower quality studies and further primary research on behavioral and combined treatments. Allen MS, Walter EE. Erectile Dysfunction: An Umbrella Review of Meta-Analyses of Risk-Factors, Treatment, and Prevalence Outcomes. J Sex Med 2019;16:531–541.

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Somatique ou psychogène ?

Received: 29 January 2022 | Revised: 3 May 2022 | Accepted: 24 May 2022

DOI: 10.1111/andr.13212

ORIGINAL ARTICLE



Primary organic versus primary psychogenic erectile dysfunction: Findings from a real-life cross-sectional study

Origine principalement somatiques > principalement psychogène

- 1/9 purement psychogène
- Patient principalement > 40 ans
- CAVE bcp de biais de sélection

Panel 1: Main organic causes of erectile dysfunction

Neurogenic

- Central (cerebral or spinal cord): for example, cerebral insult, multiple sclerosis, and spinal cord injury
- Peripheral: afferent (sensory neuropathy, eg, diabetes mellitus and polyneuropathy of various other causes)
- Efferent (autonomic neuropathy or after radical pelvic surgery)

Endocrinological

- Diabetes mellitus, hypogonadism, and hyperprolactinaemia

Vasculogenic

- Arterial: macro or micro angiopathy (eg, atherosclerosis and trauma)
- Venous: failure of the corporal veno-occlusive mechanism
- Sinusoidal: failure to relax (eg, fibrosis)

Drug-induced depression

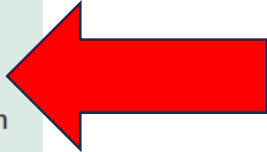
- Drugs: for example, some antihypertensives, antidepressants, antiandrogens, and major tranquillisers
- Cigarette smoking, alcoholism, and recreational drug use (eg, marijuana and heroin)

Systemic diseases and general ill health

- For example, liver, renal, respiratory, and cardiovascular disease

Local penile(cavernous) factors

- For example, cavernous fibrosis after priapism or due to other reasons, Peyronie's disease, and penile fracture



Similaire chez les < 40 ans ?

- Etiologie globalement similaires
- Psychogène > somatique ?
 - Tendance à penser cela
 - Difficile de donner des chiffres précis
 - Dépendant également de la tranche d'âge
 - Les origines vasculaires ne sont pas rares

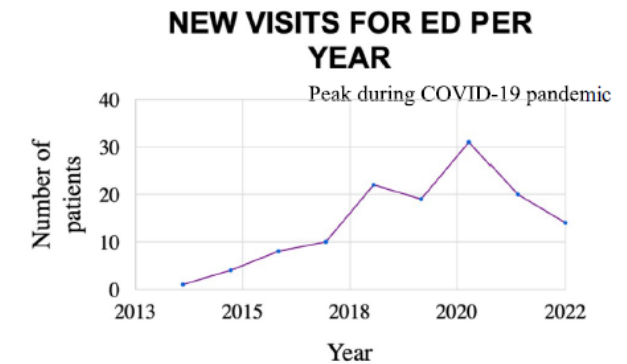


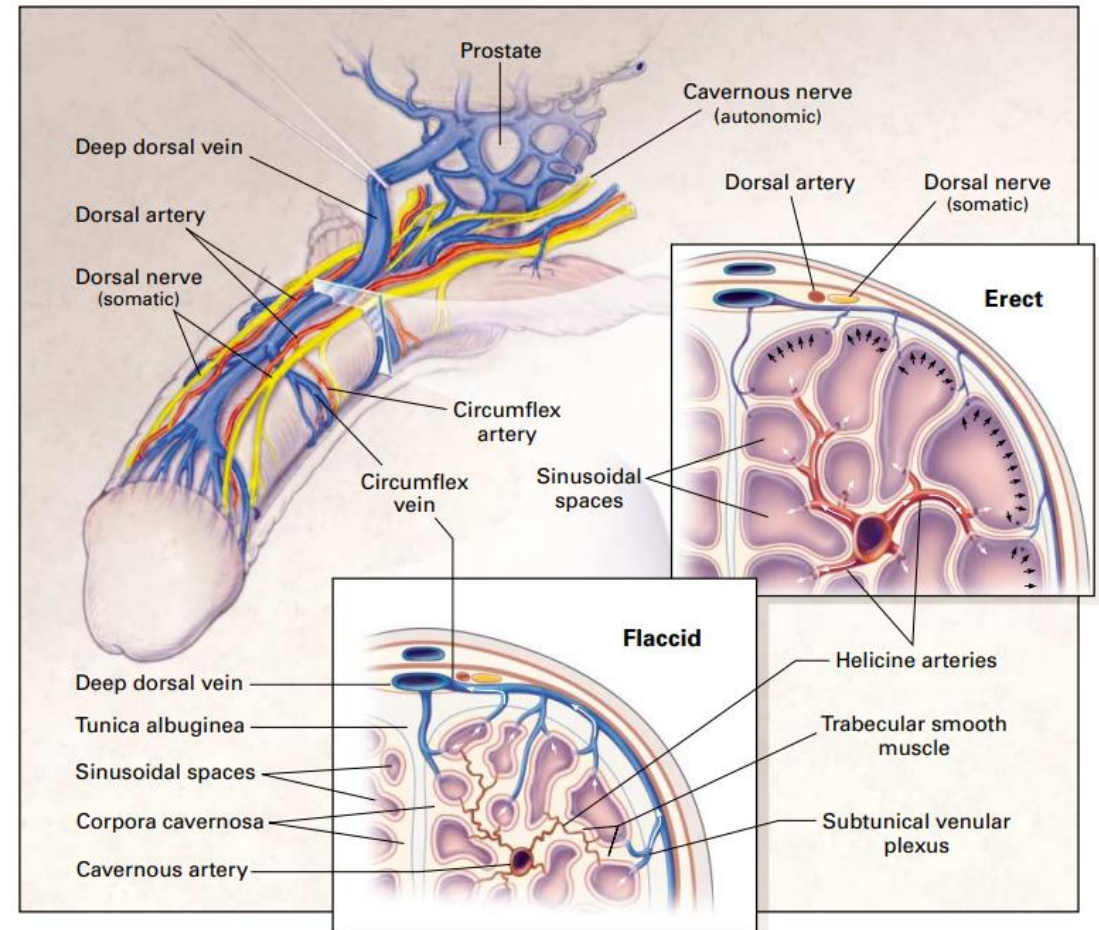
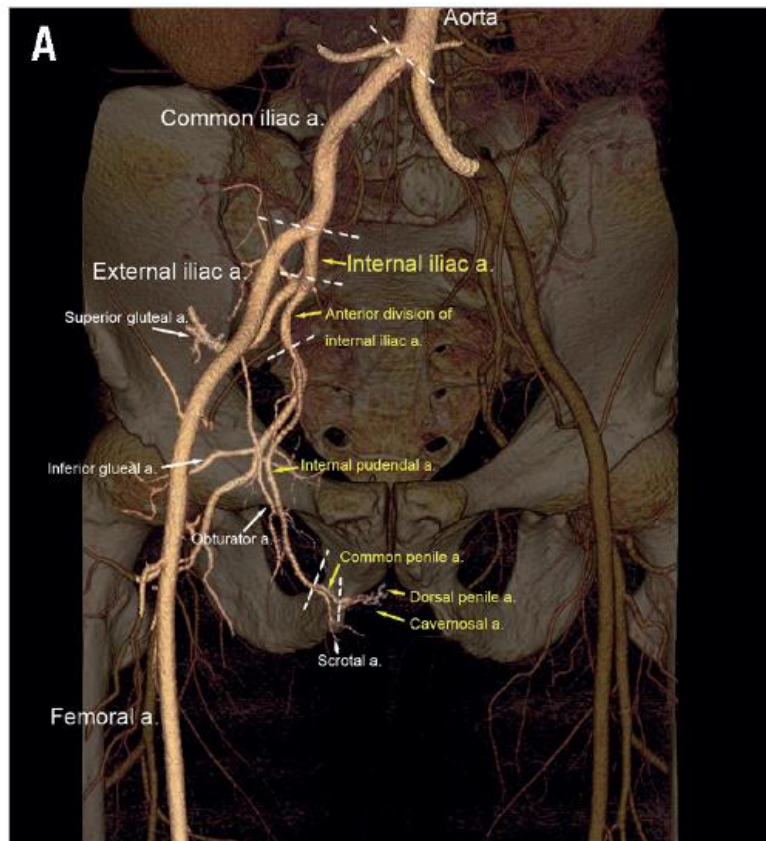
Fig.1 Number of patients presenting to our large pediatric urology practice over the last 10 years

Conclusions: ED in young men is an increasingly common condition. A careful diagnostic evaluation should focus on the identification of any underlying etiology to ensure appropriate management of patients. **Nguyen HMT, Gabrielson AT, Hellstrom WJG. Erectile Dysfunction in Young Men—A Review of the Prevalence and Risk Factors. Sex Med Rev 2017;5:508–520.**

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Key Words: Erectile Dysfunction; Young Men; Risk Factors; Prevalence; Treatment

Rappels anatomiques



Physiologie de l'érection

L'érection est un phénomène neurovasculaire complexe.

Au repos

- tonus sympathique prédomine
- contraction des CML
- Faible apport sanguin

Initiation érection par stimuli érogène (visuel, tactile, auditif, olfactif ou imaginatif)

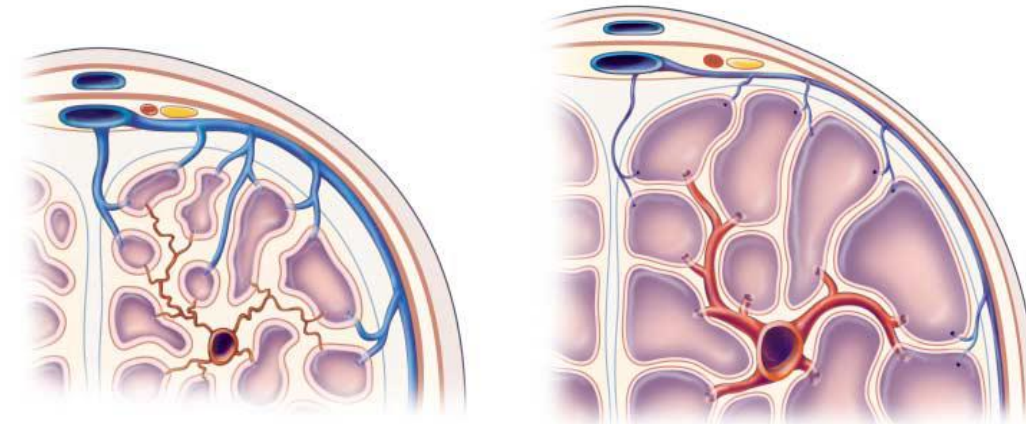
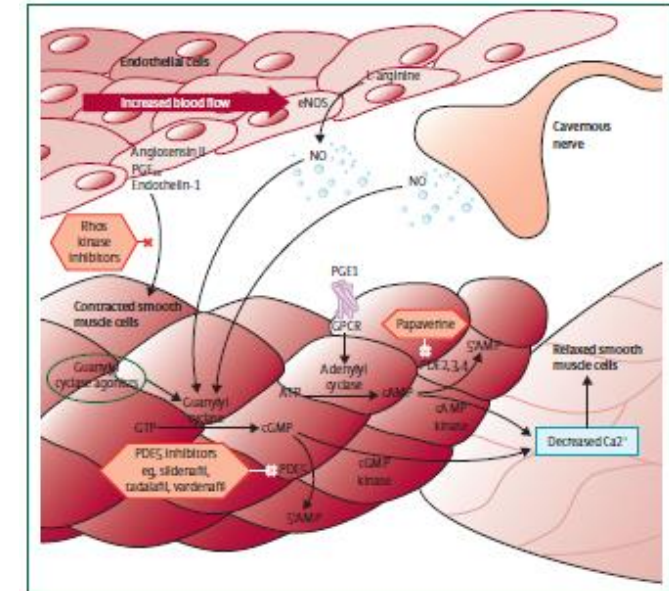
- Réponse cérébrale complexe
- Activation fibre parasympathique issues du plexus pelvien
- Libération de NO → diffuse dans les CML → relaxation (augmentation GMPc diminution Ca^{2+} intracel)
→ afflux massif de sang dans les espaces sinusoïdaux

Maintien de la rigidité

- Remplissage des sinus caverneux → compression des veines contre la tunique albuginée → diminution drainage veineux

Fin de l'érection par la reprise de l'activité sympathique

- Dégradation GMPc par la PDE5



Dysfonction érectile et maladies cardio-vasculaires

Début du 20^{ème} siècle René Leriche

- atteinte aorto-iliaque

1985 Virag

- présence plus fréquente de tabac, diabète et/ou HCT

2005 Prostate Cancer Prevention Trial (suivi de 9457 hommes)

- DE significativement associée à un risque accru d'événement CV (IM)
- DE précédait souvent l'IM de plusieurs années

2006 COBRA trial (étude observationnelle sur 245 hommes)

- DE plus élevée chez les patients atteints pluritronculaire
- DE apparaissant jusqu'à 3 ans avant le diagnostic de coronaropathie

The Multi-Ethnic Study of Atherosclerosis

- Cohorte américaine
- Commence au début des années 2000
- Inclusion questionnaire DE à partir de 2010
- 1757 participants
- Suivi pendant 3,8 ans
- Patient avec DE 2x plus de risque cardio-vasculaire

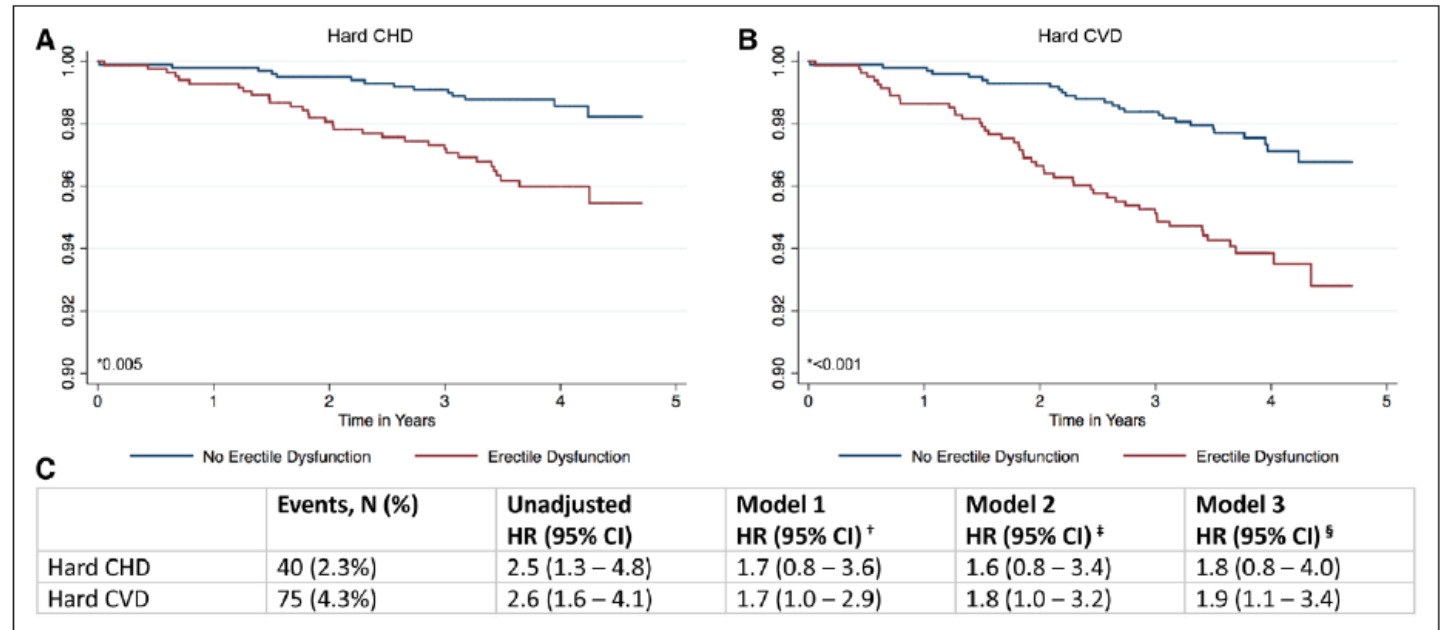


Figure. Association between ED and incident CHD and CVD hard events among 1757 male MESA participants.

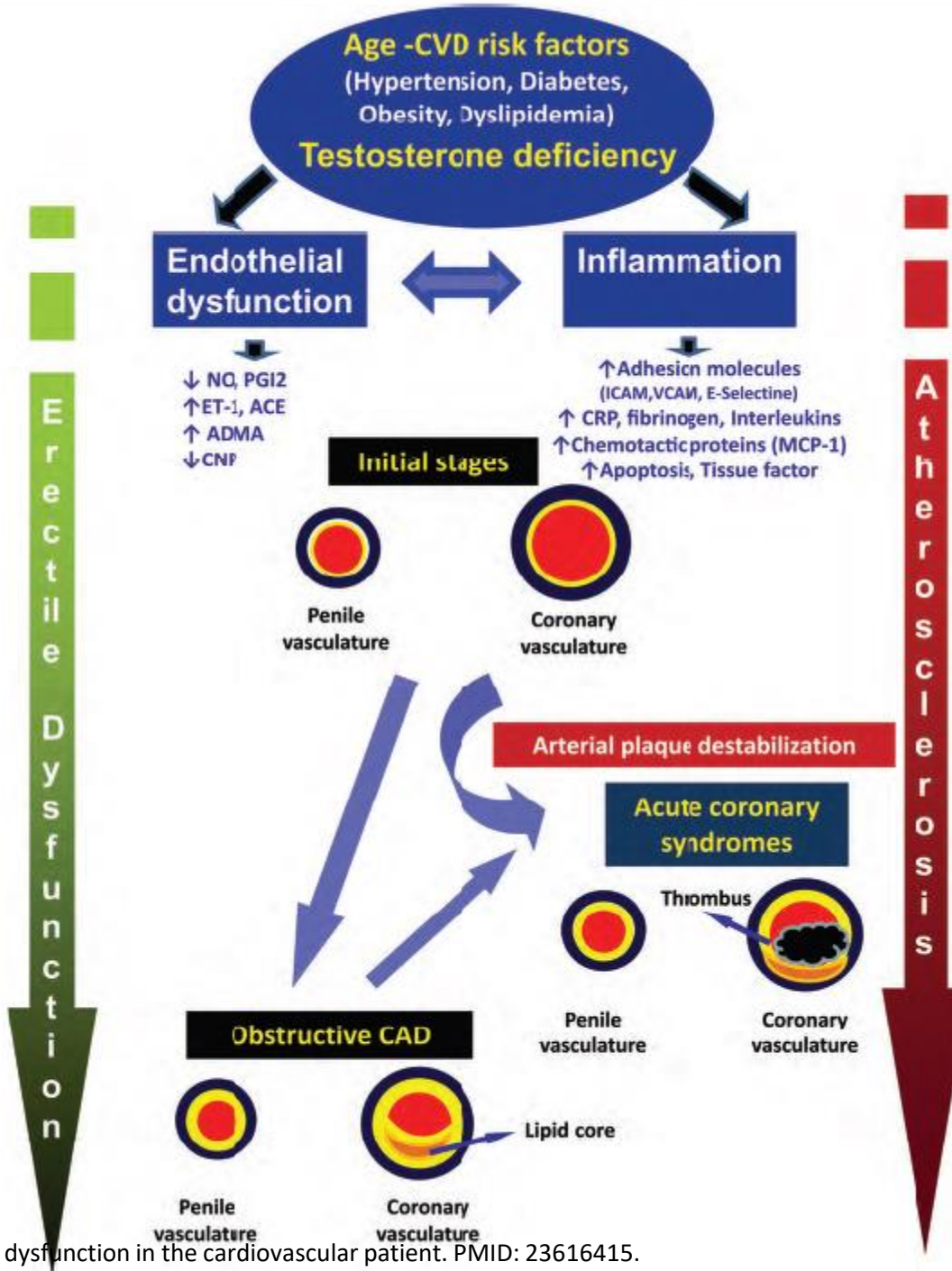
A and **B**, Kaplan-Meier cumulative survival function curves for hard CHD and CVD events by ED status. **C**, Cox proportional hazard ratios (95% CIs) of hard CHD and CVD events by ED status. **P* value by log-rank testing. [†]Model 1 adjusted for age, race/ethnicity and education. [‡]Model 2 adjusted for model 1 + smoking status, diabetes mellitus, family history of CHD, total/HDL cholesterol ratio, systolic blood pressure, antihypertensive medication use, and lipid-lowering medication use. [§]Model 3 adjusted for model 2 + depression and β -blocker use. CHD indicates coronary heart disease; CI, confidence interval; CVD, cardiovascular disease; ED, erectile dysfunction; HDL, high-density lipoprotein; and HR, hazard ratio.

Hy

gie

A

Clinical manifestation	Erectile Dysfunction	Stable/Anginal myocardial infarction
Artery diameter (mm)	 Penile Artery (1-2)	 Coronary Artery (2-4)
Artery lumen obstruction (%)		



Unstable/ Acute myocardial infarction	TIA Stroke	Intermittent Claudication
 Penile Artery (1-2)	 Internal carotid artery (5-7)	 Femoral Artery (6-8)
<i>Cut-off for symptom development (50% artery lumen obstruction)</i>		
		

Santé sexuelle dans l'évaluation cardiovasculaire

8. Mental health in specific populations and situations

8.1. Sex and gender differences in mental health and cardiovascular disease



European Heart Journal (2025) 00, 1–70
<https://doi.org/10.1093/eurheartj/ehaf191>

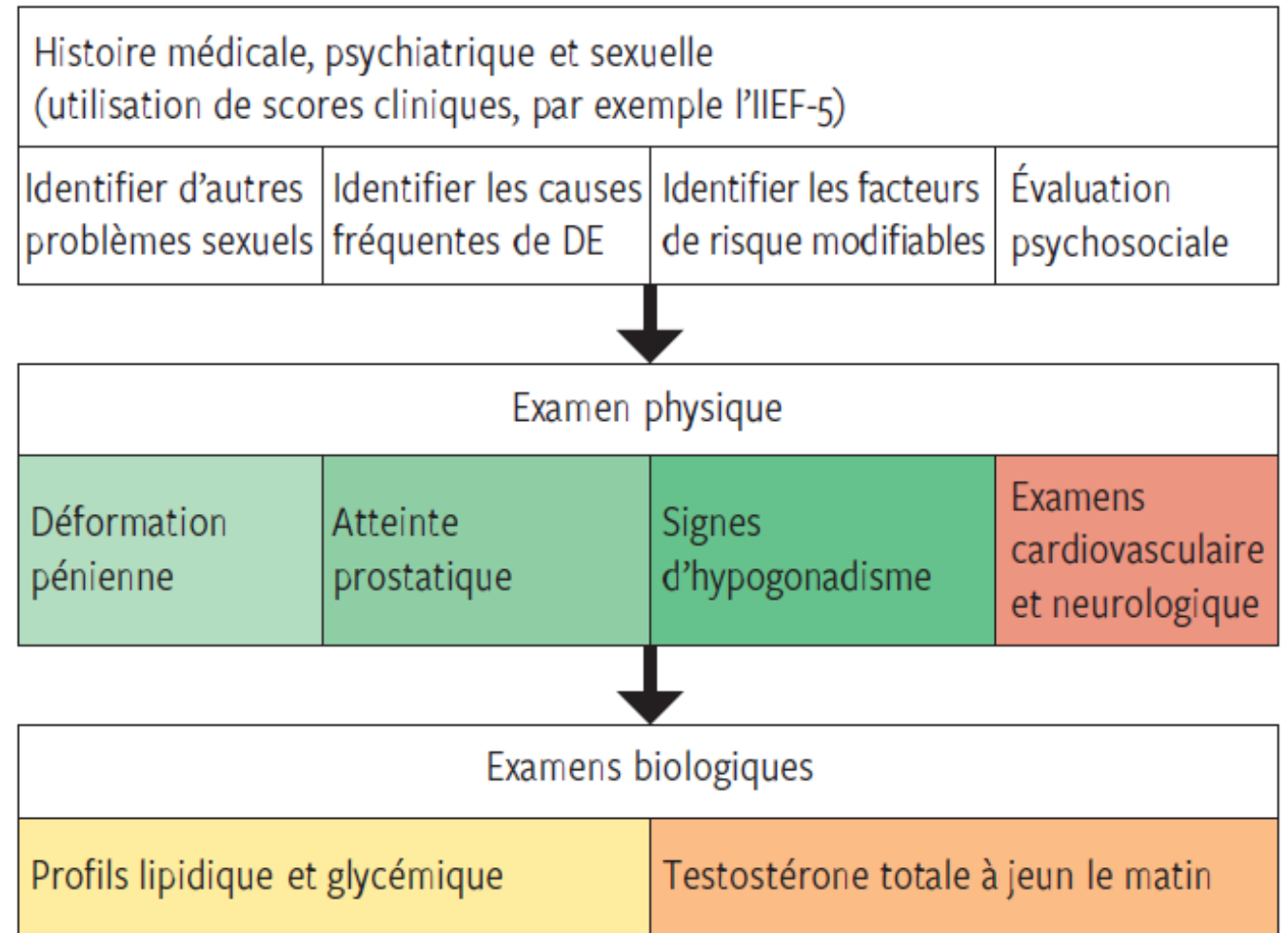
ESC GUIDELINES

2025 ESC Clinical Consensus Statement on mental health and cardiovascular disease: developed under the auspices of the ESC Clinical Practice Guidelines Committee

In men, erectile dysfunction has not only been shown to be a consequence of CVD, it is also a risk marker for future CVD.⁵¹³ A recent meta-analysis demonstrated that sexual dysfunction is also a predictor of future CVD in women.⁵¹⁴

Comment l'aborder dans un 1^{er} temps ?

- Identifier le problème sexuel, rechercher les facteurs contributifs potentiels et clarifier avec le patient et sa/son partenaire les objectifs.
- Si DE suspectée utiliser un questionnaire clinique validé (IIEF ou IIEF-5) pour objectiver la DE et la quantifier.
- Rechercher les facteurs de risque et les possibles étiologies sous-jacentes.
- Examen clinique inspection pénis, testicules, prostate, mesurer la FC, TA et BMI
- Examen biologique



Exemple de l'IIEF-5 et de l'EHS

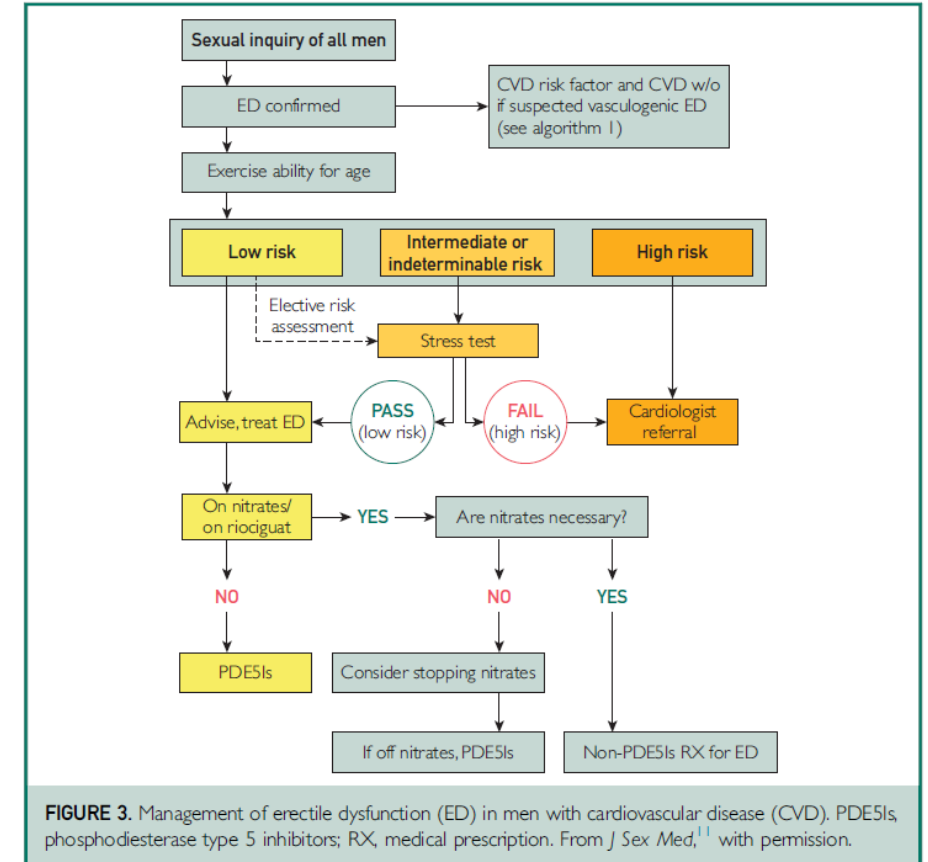
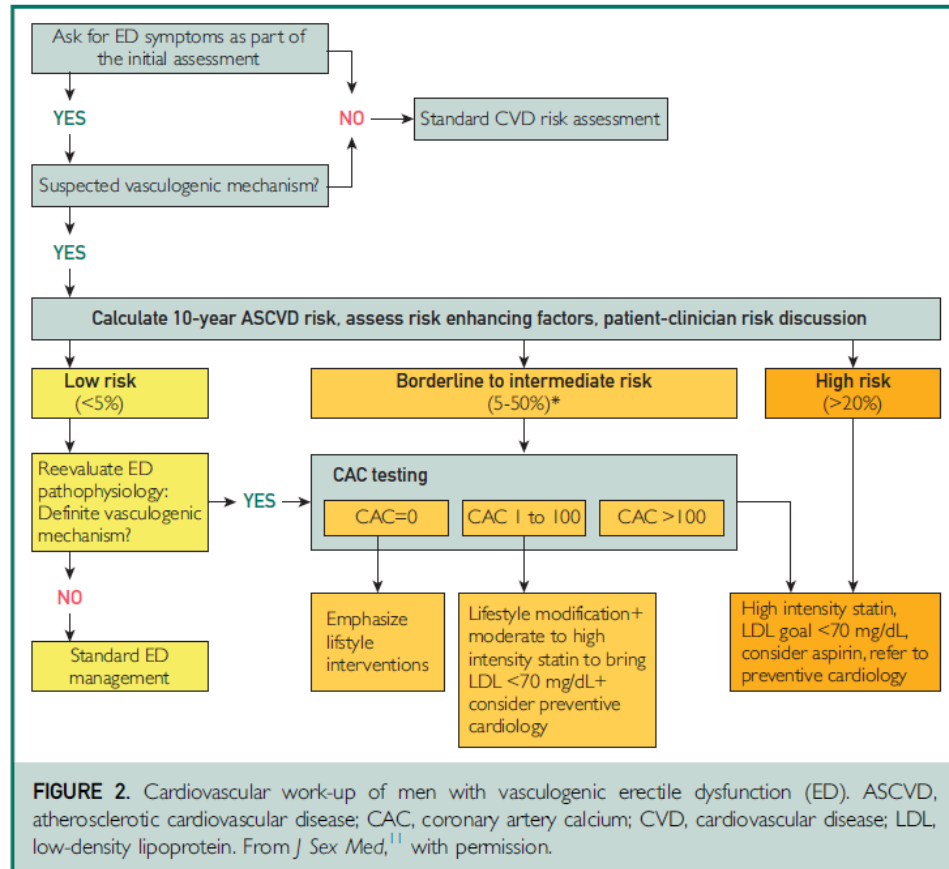
	Question	Response (eg. ☒)				
		1	2	3	4	5
1	How do you rate your confidence that you could get and keep an erection?	Very low ☐	Low ☐	Moderate ☐	High ☐	Very high ☐
2	When you had erections with sexual stimulation, how often were your erections hard enough for penetration?	Never or almost never ☐	A few times ☐	Sometimes ☐	Most times ☐	Almost always or always ☐
3	During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	Never or almost never ☐	A few times ☐	Sometimes ☐	Most times ☐	Almost always or always ☐
4	During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?	Extremely difficult ☐	Very difficult ☐	Difficult ☐	Slightly difficult ☐	Not difficult ☐
5	When you attempted sexual intercourse, how often was it satisfactory for you?	Never or almost never ☐	A few times ☐	Sometimes ☐	Most times ☐	Almost always or always ☐

Table 2 Erection Hardness Score.

0	Penis does not enlarge
1	Penis is larger, but not hard
2	Penis is hard, but not hard enough for penetration
3	Penis is hard enough for penetration, but not completely hard
4	Penis is completely hard and fully rigid

Score	Interpretation
22-25	No erectile dysfunction
17-21	Mild erectile dysfunction
12-16	Mild to moderate erectile dysfunction
8-11	Moderate erectile dysfunction
5-7	Severe erectile dysfunction

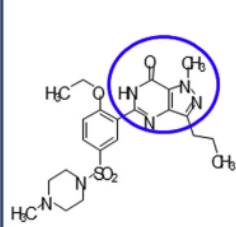
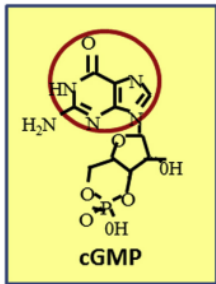
Evaluation du risque cardio-vasculaires



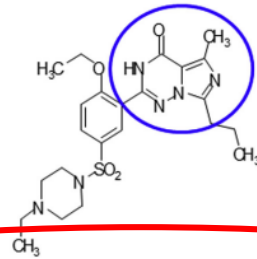
Initier une prise en charge



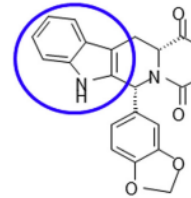
Traitements médicamenteux



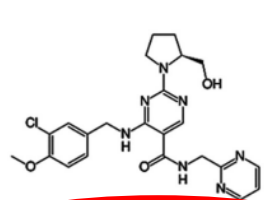
Sildenafil



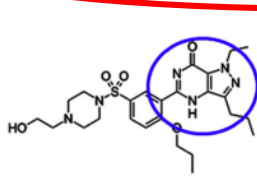
Vardenafil



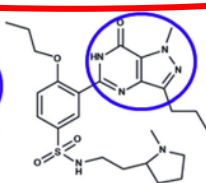
Tadalafil



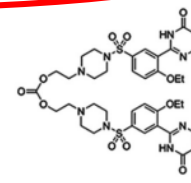
Avanafil



Mirodenafil



Udenafil



Lodenafil

Contre-indication :

- Utilisation de dérivés nitrés ou stimulateur de la guanylate cyclase (riociguat)
- ATCD récent d'IM, AVC, angor instable, IC non compensée, NOIAA
- Certaines maladies héréditaires de la rétine (rétinite pigmentaire).

Traitements oral à la demande

Sildenafil :

- 25, 50 ou 100 mg en comprimé
- 25, 50, 75 ou 100 mg en orodispersible
- Fenêtre thérapeutique de 30-60 min à 12 heures

Tadalafil :

- 10 ou 20 mg en comprimé
- Fenêtre thérapeutique de 30 minutes à 36 heures

Vardenafil :

- 5, 10 ou 20 mg en comprimé
- Existe forme orodispersible aux USA

Avanafil :

- 50, 100 et 200mg en comprimé
- Efficacité similaire aux 3 autres.

Table 5.4: Common adverse events of the four PDE5Is currently EMA-approved to treat ED*

Adverse event	Sildenafil	Tadalafil	Vardenafil	Avanafil, 200mg
Headache	12.8%	14.5%	16%	9.3%
Flushing	10.4%	4.1%	12%	3.7%
Dyspepsia	4.6%	12.3%	4%	uncommon
Nasal congestion	1.1%	4.3%	10%	1.9%
Dizziness	1.2%	2.3%	2%	0.6%
Abnormal vision	1.9%		< 2%	None
Back pain		6.5%		< 2%
Myalgia		5.7%		< 2%

** Adapted from EMA statements on product characteristics.*

Traitement oral en continu

Tadalafil uniquement

- Posologie de 2,5 ou 5 mg 1x/jour
- Possibilité de combiner avec une prise à la demande

Option pour :

- Les non répondeurs au traitement à la demande seule
- Chez > 40 ans avec DE et IU basse récidivante/HBP

Effet placebo ?

JAMA
Network | Open™

Original Investigation | Urology

Placebo Responses Among Men With Erectile Dysfunction Enrolled in Phosphodiesterase 5 Inhibitor Trials A Systematic Review and Meta-analysis

Alexander Stridh, MSc; Moa Pontén, MSc; Stefan Arver, MD, PhD; Irving Kirsch, PhD; Christoph Abé, PhD; Karin B. Jensen, PhD

RESULTS A total of 63 studies that included 12 564 men (mean [SD] age, 55 [7] years; age range, 36-68 years) were included. Erectile function was significantly improved among participants in the placebo arm, with a small to moderate effect size (Hedges g [SE], 0.35 [0.03]; $P < .001$). Placebo effect size was larger among participants with ED associated with posttraumatic stress disorder (Hedges g [SE], 0.78 [0.32]; $P = .02$) compared with the overall analysis. No significant difference was found between placebo and PDE5Is for ED after prostate surgery or radiotherapy (Hedges g [SE], 0.30 [0.17]; $P = .08$).

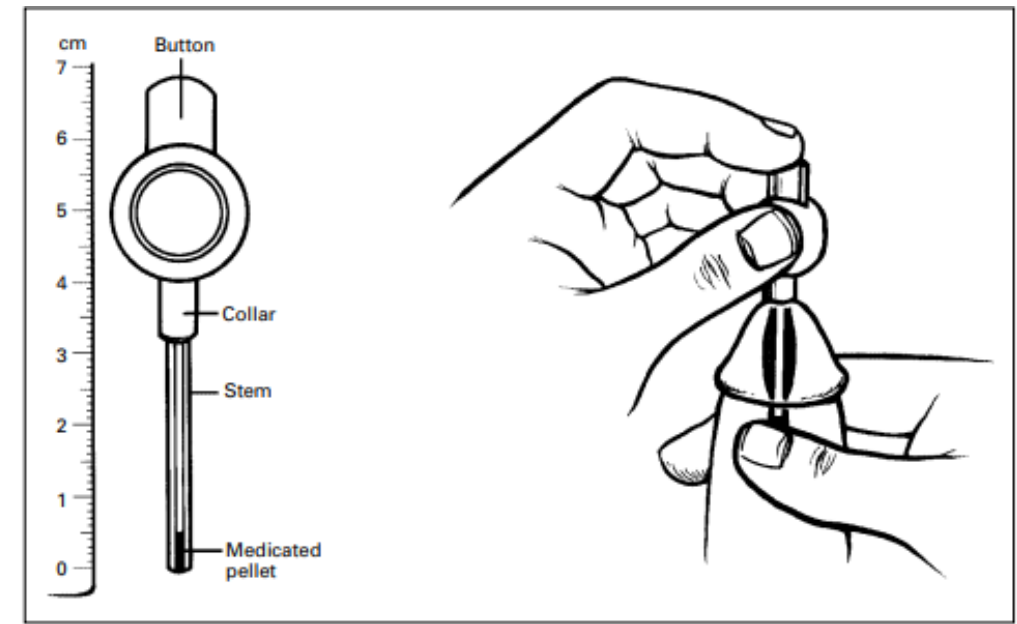
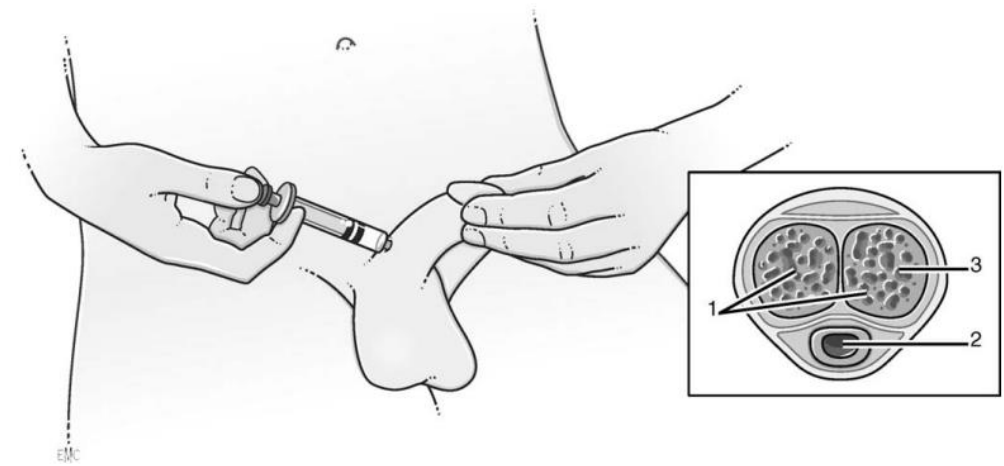
Injectons intracaverneuses et application topiques

Injection intracaverneuse (IIC)

- Alprostadil apparu avant même les formes orales
- Existe d'autres molécules (seules ou combinées)
- Taux de succès intéressant selon les études
- limitation :
 - Apprentissage de l'auto-injection
 - Les risques (priapisme, douleur, fibrose)

Application topique ou intra-urétrales

- Topique
 - Une ECR montre une amélioration des IIEF mais < aux IIC.
- MUSE (Medicated Urethral System for Erection)
 - Bien tolérée, parfois même préférée par les patients
 - Option complémentaire si auto-injection pas réalisable.



Autres approches thérapeutiques

Mécanique ou physique :

- Pompe à vide
 - Résultats intéressants chez les patients diabétiques ou âgées
 - CAVE lésions cutanées ou douleurs par l'utilisation répétée
 - Pertinent si fréquence sexuelle faible
- Ondes de choc extracorporelles de faible intensité
 - Essaie qui montre une amélioration des scores IIEF
 - Hétérogénéité des protocoles tailles souvent limitées des études
 - EAU propose cette approche chez patients vasculaires non répondeurs aux IPDE5
 - Pas pris en charge par la LAMAL

Autres :

- Injection intracaverneuse de plasma riche en plaquettes
- Neurotoxine botulinique A
- Injection intracaverneuse de cellule souche



Poursuites des investigations

Nocturnal Penile Tumescence and Rigidity test (NPTR)

- Mesure du nombre, de la tumescence, la rigidité et la durée de l'érection.
- Approche pour différencier de manière objective une origine somatique ou psychogène.
- Selon EAU doit être fait à 2 reprises, au moins 60% de rigidité et ≥ 10 minutes.



Limitations :

- Corrélation entre érection et rapport sexuel achevé ?
- Corrélation entre rigidité axiale et radiale ?
- Facteurs confondants (âge, situations, troubles du sommeil)

Le pharmaco- écho-doppler pénien (PEDP)

Examen de 2^{ème} intention

- Forte suspicion d'une origine vasculaire
- Echec traitement médicamenteux initiaux.

Conditions :

- Patient bien informé.
- Cliniciens expérimentés.
- Pièce calme et tempérée.

Matériel :

- Echo-Doppler linéaire à haute fréquence (7,5-12 MHz), sonde à basse fréquence à disposition (exploration axe aorto-iliaques)
- Matériel pour injection intracaverneuse

Pratique du PEDP

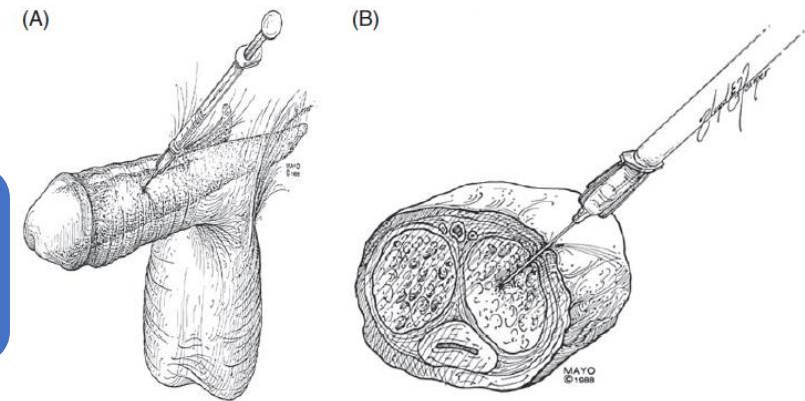
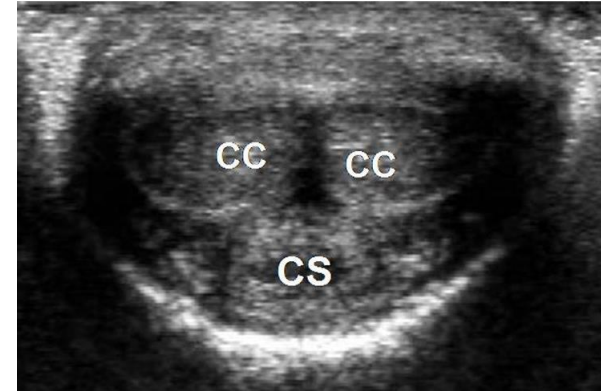
Echo-Doppler à l'état flasque :

- Analyse des structures
- Présence d'anomalies, épaissements, calcifications et/ou autre

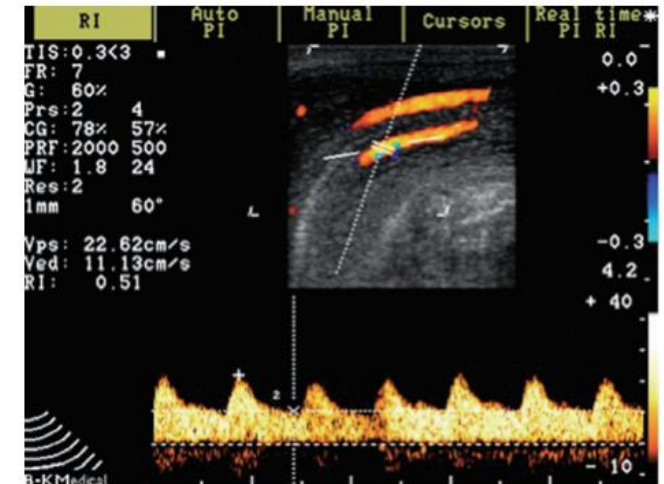
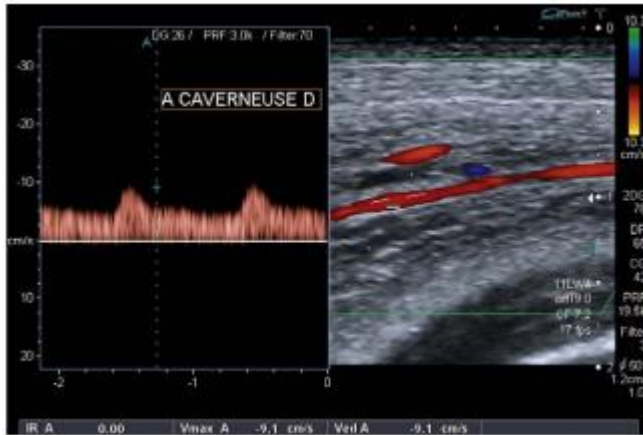
Echo-Doppler après injection intracaverneuse (IIC) d'une molécule érectrice

- Alprostadil
- Papaverine
- Phentolamine

Echo-Doppler artériel complet (aorto-pelvien +/- MI si nécessaire)

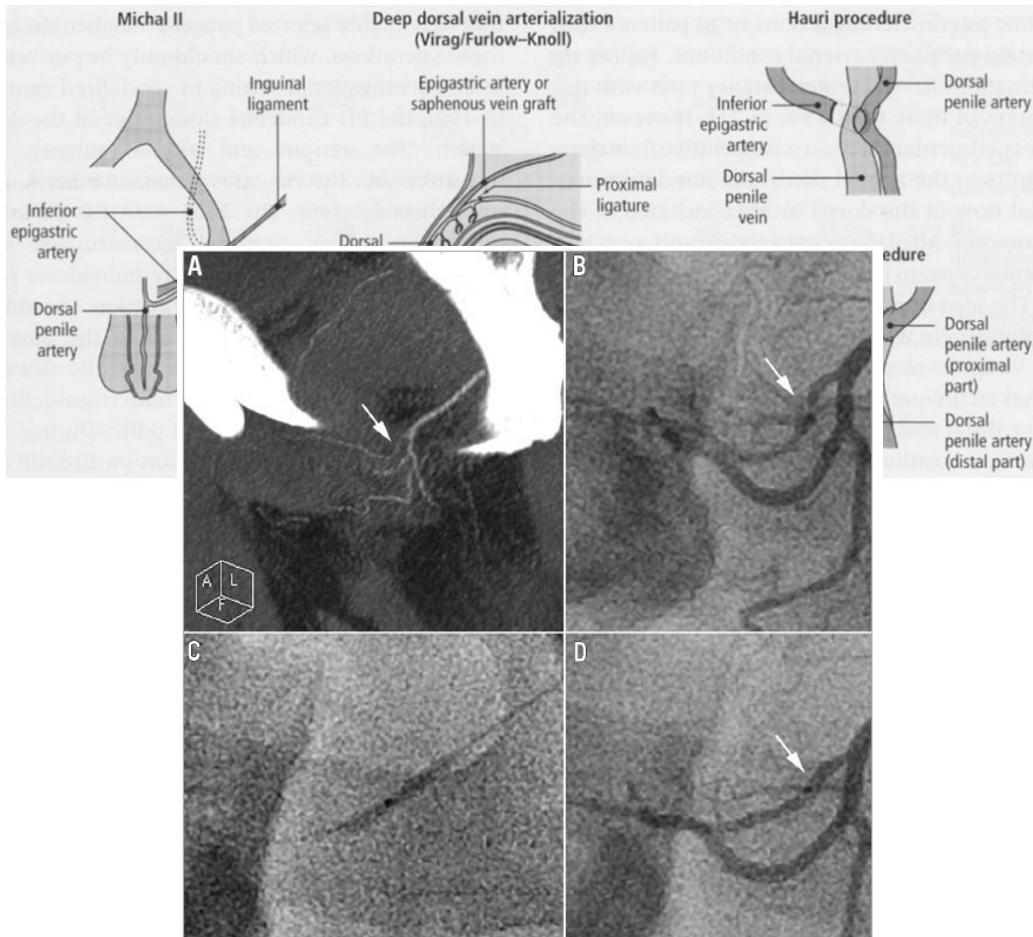


Critères hémodynamiques



	Non vasculaire	Artériel	Veineux	Borderline	Mixte
PVS	≥ 30 cm/sec	< 25 cm/sec	≥ 30 cm/sec	25-30 cm/sec	< 25 cm/sec
IR	> 0.8		< 0.6	0.6-0.8	< 0.6
VTD	< 3 cm/sec	< 3 cm/sec	≥ 6 cm/sec	3-6 cm/sec	> 6 cm/sec
TM	< 100 ms	> 100 ms			

Approches interventionnelles artérielles

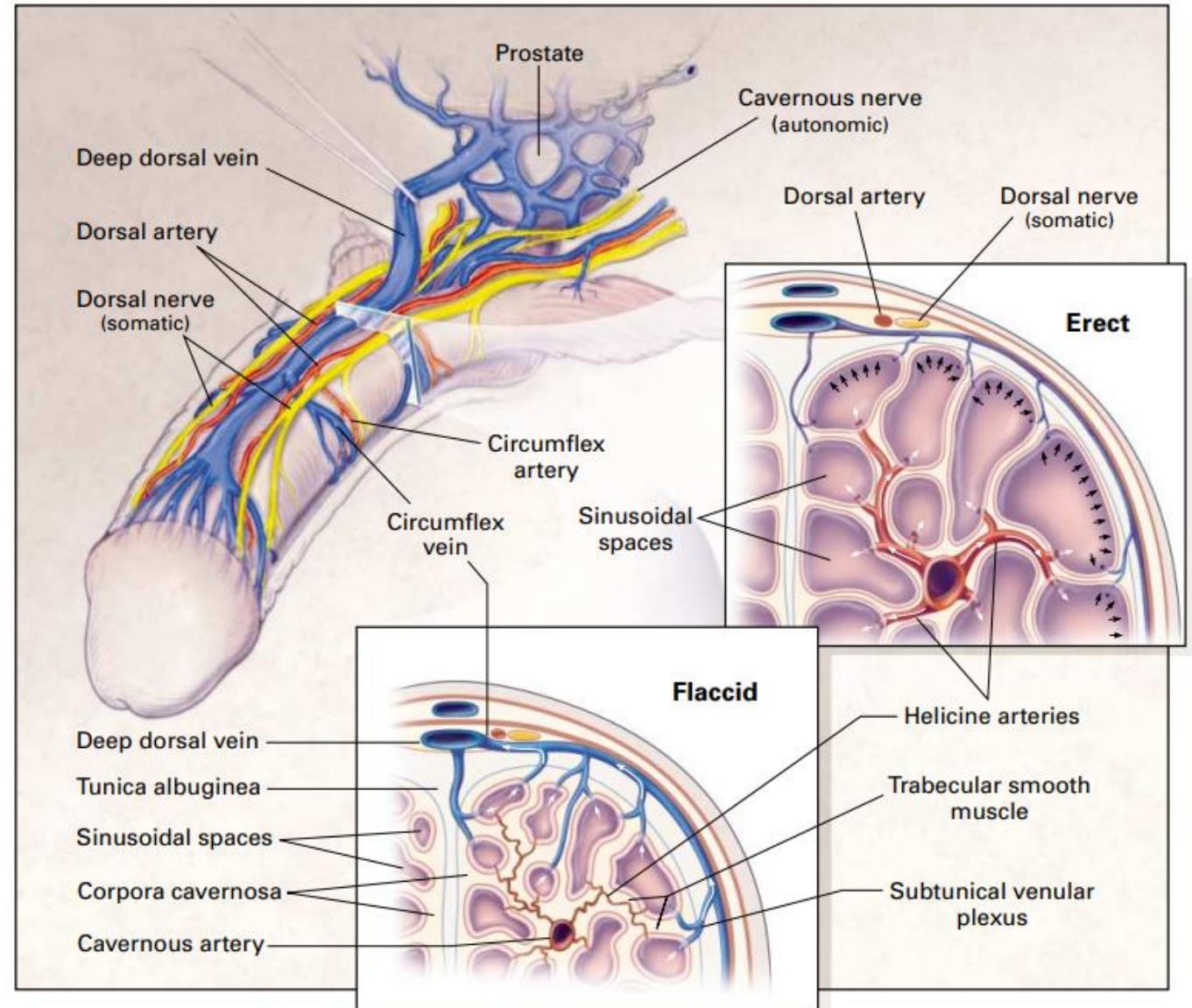


- Revascularisations chirurgicales :
 - anastomose de l'artère épigastrique inférieure aux corps caverneux ou aux artères dorsales
- progressivement abandonnées
 - Risques de priapisme à haut débit
 - Fibrose
 - Taux de succès limités.

Revascularisations endovasculaires, artères iliaques internes, pudendales ou péniennes :

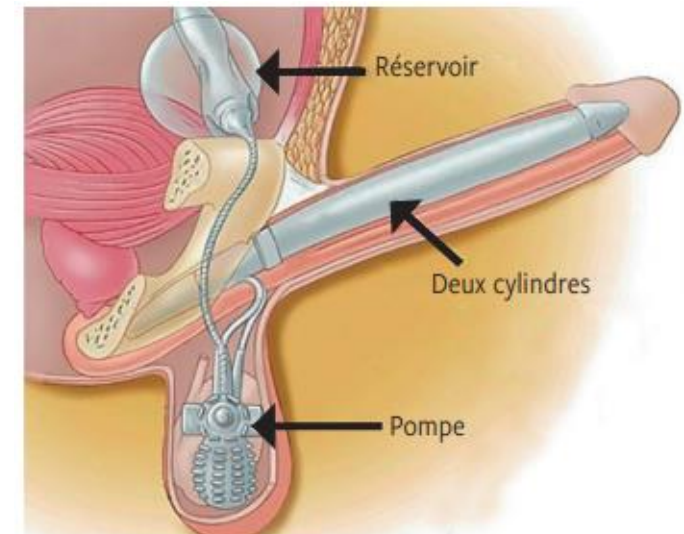
- alternative moins invasive
- bons résultats pour les lésions proximales.
- Plus hétérogènes pour les atteintes distales

Fuite veineuse?



Les implants péniers d'érection

- En cas d'échec des différents traitements
- Option définitive
- Peut-être semi-rigide ou gonflable
- Risque chirurgicaux
- Taux de satisfaction élevés
- Bonne longévité (moyenne de 12.5 ans)



Take home message

- La dysfonction érectile est fréquente
- L'origine vasculaire est la cause principale des étiologies somatiques
- La prise en charge des FRCV est essentielle
- Le pharmaco-écho-doppler pénien est un bon outil pour orienter le diagnostic et la prise en charge
- Les inhibiteurs de la phosphodiesterase sont toujours d'actualité
- Des approches interventionnelles plus invasives sont possibles mais faut bien évaluer le risque/bénéfice
- La prothèse pénienne est toujours une option en cas d'échec



Merci pour votre
attention

Questions ?