Surgery for Treatment of Erectile Dysfunction

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Surgery for Treatment of Erectile Dysfunction

一、陰莖靜脈截除手術
Penile Venous Stripping Surgery

二、人工陰莖植入手術
Penile Prosthesis Implantation
Refined Penile Venous Surgery

- 隱莖勃起機轉 (Mechanism of Penile Erection)
- 隱莖靜脈系統 (Penile Venous System)
- 手術技巧 (Surgical technique)
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- 討論 (Discussion)
Erection involves sinusoidal relaxation, arterial dilatation, and venous compression. The importance of smooth muscle relaxation has been demonstrated in animal and human studies.

(Campbell-Walsh Urology, 10th ed. 2012)
For venous surgery, the outcomes balance sheet shows an estimated probability for return to intercourse of 43.3%, based on data from 43 patient groups (1,801 patients). The estimated probability for patient satisfaction following venous surgery is 43.8%.
Vascular Evaluation

Color Duplex Ultrasound of the penis

Dual pharmaco-cavernosography
手術適應症 (Surgical Indication)

受勃起功能障礙困擾半年以上、診斷有陰莖靜脈滲漏、經性功能門診咨商、篩選的病患，排除出血性體質，原則上均可考慮採用，而不僅限於條件非常好 (highly selective) 的病患才適合接受這種手術。

尤其對於其它治療方式 [例如口服磷酸二酯酶-第5型 (Phosphodiesterase-5, PDE-5)抑制劑、海綿體內藥物注射、真空吸引器等] 不適用或失效，但又不想立刻植入人工陰莖的病患，是另一種替代性的選擇。
手術適應症 (Surgical Indication)

精神性因素、男性荷爾蒙缺乏症 (Androgen deficiency) 或高泌乳症 (hyperprolactinemia)、神經系統疾病 (Neurological disease)、嚴重陰莖動脈灌流不足、嚴重或控制不良的慢性全身性疾病 (例如糖尿病、肝硬化及尿毒症)、服用可能導致勃起功能障礙藥物、出血性體質，原則上均可考慮採用，不受年齡及陰莖靜脈滲漏程度的限制，但手術效果可能較差。
陰莖靜脈截除手術－截除滲漏的陰莖靜脈血管！
Local Anesthesia

Dorsal nerve block, ventral and peripenile infiltration.

Lidocaine (0.8%, 50 ml) with Epinephrine

(Hsu et al. J Androl. 2003.)
Microsurgical Drill
Electrocautery Spared

Effect of electrocautery on the sinusoid in human penis

(Banya et al. Two circulatory routes within the human corpus cavernosum penis: a scanning electron microscopic study of corrosion casts. J. Urol. 1989)

(Hsu et al. J Androl. 2004)
Clinical Experience of a Refined Penile Venous Stripping Surgery Procedure for Patients With Erectile Dysfunction: Is It a Viable Option?

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ABSTRACT: Penile venous surgery might not be considered an appropriate treatment for erectile dysfunction (ED) because of disappointing functional outcomes and unacceptable, seemingly unavoidable, penile deformity. We report results of a refined penile venous stripping method in patients with veno-occlusive dysfunction (VOD). From 2000 to 2003, 341 of 467 men with ED were diagnosed with VOD via cavemosography and Doppler sonography. Patients were excluded from undertaking cavemosography if they had an untreated chronic systemic disease. Patients who had undergone the first penile venous surgery in other institutes were also excluded from this study because of the protracted surgical time and unpredictable functional outcomes, because severe fibrosis may prevent patients from completing penile venous removal. Of these 341 men, 178 were treated with a refined venous stripping surgical method (surgery group) and 163 patients were treated without this surgery (control group). In the surgery group, 167 were available for long-term follow-up using the abridged 5-item version of the International Index of Erectile Function (IIEF-5) scoring system. The operative time ranged from 2.1 to 5.0 hours. The follow-up period ranged from 5.1 to 8.2 years, with an average of 7.7 ± 1.4 years. The difference between the preoperative (9.7 ± 3.9) and postoperative (21.6 ± 2.8) IIEF-5 scores was significant (P < .001). Overall, 90.4% of the surgery group (151 of 167) reported improvements after surgery. A significant decrease in IIEF-5 scores (10.4 ± 3.8 vs 7.9 ± 3.2, P < .001, n = 121) during the same period of follow-up was, however, noted in the control group. This refined penile venous stripping surgery delivered favorable results and is a viable alternative for treating VOD.

Key words: Cavernosal vein, deep dorsal vein, para-arterial vein, veno-occlusive dysfunction.

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(Hsu et al. J Androl. 2010)
Objectives: With the discovery that the majority of patients with erectile dysfunction (ED) have veno-occlusive dysfunction (VOD), there has been resurgence in penile venous surgery. However, there is controversy about its effectiveness because of disappointing functional outcome and unacceptable penile deformity. We report long-term results of the refined penile venous stripping surgery on patients with VOD.

Materials and Methods: Between Jan. 2006 and Jan. 2011, 47 patients aged 25 to 71 years (mean age 47.2 years) underwent penile venous stripping surgery for VOD documented by cavernosography and color duplex Doppler ultrasonography. Before cavernosography each patient received a standard evaluation to rule out causes of ED other than VOD. Investigation included a thorough history and physical examination as well as serum testosterone determination. Patients who had suffered an untreated chronic systemic disease were excluded from this study, as were those who had undergone previous penile surgery in other institutions. Among them two patient had a history of prostatic cancer status post laparoscopic radical prostatectomy. 41 were available for long-term follow-up employing the sexual health inventory for men (SHIM) scoring system.

Results: The total duration of surgery ranged from 3.2 to 5.5 hours. The follow-up period ranged from 1.4 to 5.4 years with an average of 3.7 ±1.2 years. There was significant difference (p < 0.01) between the preoperative SHIM (9.8±5.4) and postoperative (17.4±5.9) scores. Overall 33 of 41 patients (80.5%) reported improvements to resume satisfactory intercourse following surgery. In retrospect, 35 of 41 patients (85.4%) would undergo the procedure again, and 36 patients (87.8%) would recommend this procedure to other patients. Complications seem minor and negligible.

Conclusion: Introducing the refined penile venous stripping procedure allowed a trained urologist to achieve favourable results. In this regards, Far from being experimental, the procedure finds a surgical niche and is a viable alternative for treatment of ED patients with VOD.
可能的併發症
Potential Complications

局部麻醉的併發症包括針紮到血管(13.8%)、暫時性心悸(3.9%)、皮下淤血(19.3%)等。
與手術本身相關的併發症包括血腫、感染、麻木感、包皮局部缺血壞死等，但只要熟練以上手術技巧，發生機率極低。
傷口疼痛於術後1-2日較明顯，通常給予Acetaminophen或非類固醇類止痛藥(NSAID)返家服用，即可達到良好止痛效果。
根據最新了解的陰莖靜脈系統作为陰莖靜脈截除手术的蓝本，在医学学理上，其术后勃起功能的改善程度应优于传统的手术方式，这在临床经验上已获得印证，短期的追踪结果亦显示此一趋势，但仍需追踪更长期的结果以获得相关结论。

术后勃起功能大多会有不同程度的改善，且能避免可能的併發症；但因每位病患體質条件不一，術後效果會因人而異。
對於勃起功能障礙，陰莖靜脈截除手術是最自然的治療方式
這種純粹局部麻醉的精細手術具有安全，有效、可靠、方便的特點，術後即可返家，讓病患的隱私更有保障，更早恢復日常生活及工作
即使術後勃起功能改善未盡如人意，尚可搭配併用其它治療方式以輔助改善勃起功能
最後，如所有其他治療方法都失效，仍有機會選擇植入人工陰莖。
人工陰莖植入手術
Penile Prostheses Implantation (PPI)

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人工陰莖植入手術
Penile Prosthesis Implantation (PPI)

勃起功能障礙，治療的最終目的就是要使陰莖勃起達到一定的硬度，可以進行性行為。

人工陰莖植入手術就是將人工陰莖（penile prosthesis）植入陰莖海綿體，取代充血鼓脹的海綿體，但人工陰莖仍包覆在陰莖白膜內，使陰莖達到堅硬的程度，外觀仍與正常陰莖相差無幾，觸感也頗自然。
不管是任何原因引起的勃起功能障碍、困扰半年以上、所有其他治疗方法都失效，经性功能门诊咨询，仔细筛选的病患，排除出血性体质，原则上均可考虑采用。
人工陰莖種類
Penile Prosthesis Models

Malleable (semirigid). 可折式半硬人工陰莖:
- 機械接合樣式 (mechanical rod) 的人工陰莖有 Dura II (AMS)
- 具可塑性樣式 (malleable rod) 的人工陰莖有 650/600M (AMS)、Acuform (Mentor)

Inflatable, 可膨脹式人工陰莖:
- 單一可膨脹式人工陰莖 (unitary inflatable device): [Hydroflex、Dynaflex (AMS)]
- 兩件可膨脹式人工陰莖 (Two-piece inflatable devices): [Ambicor (AMS)、Mark II (Mentor) (2000年停產)]
- 三件可膨脹式人工陰莖 (Three-piece inflatable devices): (700 series (AMS), Alpha 1 and Titan (Mentor))
2 rod-like cylinders that are implanted in the corpora cavernosa. The prosthesis can have a mechanically jointed ‘backbone’.

Considered for patients:

- abdominal hardware such as reservoir balloons cannot be implanted (that is, patients undergoing extensive abdominal/perineal surgery and those receiving peritoneal dialysis).
- limited manual dexterity
- significantly obese
Malleable rods: 650/600M (AMS); Acu-Form (Mentor)

- A wire core with polyester covering and silicone outer jacket.
- Cylinder lengths range from 14 to 27 cm.
- Model 600 (9.5- and 11.5-mm width sizes), model (11- and 13-mm-width sizes); Mentor Acu-Form (9.5, 11 and 13mm)

這款人工陰莖由於零件少，有使用簡單、耐久性良好、不易故障等優點。由於無伸縮能力，起初病患會抱怨陰莖不會消軟。
Advantages for Physicians

- Simple implantation procedure
- Easy cylinder length adjustment with Snap-fit Rear Tip Extenders (RTEs)
- Manual attachment; no tools needed
- RTE placed on proximal cylinder end only
- 0.5 cm length adjustability
- Same RTEs as used with AMS 700® LGX/CX/CXR cylinders
- Cylinders available in 9.5 mm, 12 mm and 14 mm diameters with 12, 16, and 20cm lengths per each diameter for the best patient fit
- Optimal balance between rigidity and concealment
- MRI compatible
- Opportunity for outpatient implantation

Advantages for Patients

- Maintains firm erection
- Superior concealment
- Shaped to provide good cosmetic result
- Multiple diameter and length configurations for a wide range of patient sizes
- Easy to position and excellent for men with limited dexterity
單一可膨脹式人工陰莖

Unitary inflatable penile prosthesis (Hydroflex、Dynaflex)

自容充水式(self-contained unit)，集人工陰莖體、儲水囊及調水泵於一身，每一人工陰莖體包括了遠端部分、中央室(central chamber)和近端儲水囊。要勃起時，擠壓近端儲水囊讓中央室內充水2─3毫升，即可達堅硬勃起。將人工陰莖體折彎曲55°以上即可啟動壓力閥門，讓水流回近端儲水囊，使人工陰莖體消軟。不過充水時固然能充份膨脹，但「放水」後卻無法「回到起跑點」。有些病患陰莖較寬大，人工陰莖體經常充水不完全，進行性行為時會有人工陰莖移動(shifting)及彎曲(buckling)的情形。另有些病患抱怨人工陰莖體不容易充水。此外，這款人工陰莖不適合植入曾有遠端尿道侵蝕(urethral erosion)病史的病患。

available in two widths—11 and 13mm
Two-piece inflatable devices (Ambicor (AMS) and Mark II (Mentor) (production discontinued in 2000)):

Two-piece inflatable devices (Ambicor (AMS) and Mark II (Mentor) (production discontinued in 2000)):

This device reduces the trouble of implanting the reservoir in the abdomen, making it easier to implant a three-piece inflatable artificial penis. Its device consists of a pair of inflatable artificial penile bodies implanted into the corpora cavernosa on both sides, connected by a tube to the reservoir pump located in the scrotum. However, its disadvantage is that the reservoir capacity is limited to approximately 15-20 milliliters. When the penis is soft, there are still 5-10 milliliters of liquid remaining in the artificial penis body, causing incomplete softening. Patients with larger penises criticize this device for its limited capacity, not enough to fully inflate the artificial penis body; while patients with smaller penises complain that it is difficult to fully soften. This artificial penis is suitable for patients who have difficulty or contraindications to implanting the reservoir, such as those who have undergone pelvic or kidney transplantation.
三件可膨脹式人工陰莖

Three-piece inflatable devices (700 series (AMS), Alpha 1 and Titan (Mentor)):

這款裝置更加複雜，包括植入左右側陰莖海綿體內成對的可膨脹人工陰莖體、位於陰囊的調水泵及位於腹部的大型儲水囊。被證明是最令人滿意的裝置，硬度良好(甚至對於較大的陰莖)，不論勃起或消軟，看起來最自然。此外，人工陰莖體消軟時可以減少對於白膜和陰莖海綿體產生的壓力。患有糖尿病、以前曾有人工陰莖體突出或感染的病患，適用這款裝置。
Three-piece inflatable devices (700 series (AMS))

AMS-700 series provide Ultrex models, which can elongate distally and increase the circumference by a maximum of 20%; CX models can only increase the circumference. CX models are most suitable for patients with scar tissue or penile curvature. This series has an innovative feature called InhibiZone, which is an artificial penis exterior silicone cover treated with antibiotics (minocycline hydrochloride and rifampin), showing that it can reduce infection rates by approximately half (reduced to 0.7%) [Carson, 2004; Abouassaly et al, 2004].
臨床上，人工陰莖植入手術多半採用半身麻醉或全身麻醉技術。

局部麻醉技術，使用Xylocaine劑量不超過400毫克(mg)，相對安全又方便，術後即可返家，較不影響日常生活及工作。
- proximal dorsal nerve block
- peripenile infiltration
- crural block
手術技巧 (Surgical technique)

手術方式因選用不同種類的人工陰莖而有差異，切口位
於冠狀溝下 (subcoronal)、恥骨下 (infrapubic) 或陰莖陰囊
交界處 (penoscrotal) [Garber and Marcus, 1998; Montague, 2007]。切開白膜以便植入人工陰莖，裝置好後用 6-0 尼
龍線 (nylon) 精細縫合白膜切口；植入三件式人工陰莖時，
調水泵裝置於陰囊中，儲水囊置放於恥骨後膀胱前的空
間，人工陰莖體則在陰莖海綿體內，三個物件依靠蜿蜒
的管線連接。裝置妥善後，縫合傷口。
可能的併發症 (Possible Complications)

- 陰莖縮短 (Loss of Length, Shorter size of erection)
- 勃起周長變小 (Decreased girth of erection)
- 陰莖外形改變 (Change in shape)
- 人工陰莖機械故障 (Mechanical failure of the prosthesis)
- 調水泵問題 (Pump problems)
- 陰莖組織侵蝕或人工陰莖體破出 (Erosion or cylinder extrusion)
- 疼痛 (Pain)
- 感染 (Infection)
- 出血及血腫 (Bleeding and hematomas)
- 感覺喪失和射精 (Sensory loss and ejaculation)
- 如果移除人工陰莖，就沒有勃起 (No erection if device is removed)
- 修復手術的可能性 (Possibility of revision surgery)
- 局部麻醉的併發症包括針紮到血管 (13.9%)、暫時性心悸 (5.8%)、擴張海綿體時疼痛 (10.2%)、加強注射劑量 (booster injection) (14.6%) 等。