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Urological notes

Venous malformation of the glans penis: Every 5mm Nd-YAG laser irradiation

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Running titles: Venous malformation of the glans penis

Vascular anomalies of the male genitalia are rare with no consensus on classification, cause, and treatment⁽¹⁾. They include hemangiomas and vascular malformations.

Hemangiomas are on the skin and may demonstrate significant growth after birth followed by slow involution. Vascular malformations are present at birth in the subcutaneous tissues and tend to persist or enlarge in adolescence⁽²⁾.

Venous malformation (VM) is one of the slow-flow vascular malformations and affects the glans penis⁽²⁾. VM of glans penis show soft, compressive, blue, endophytic, and/or exophytic masses, and are diagnosed by color Doppler ultrasonography, which shows dilated vein without pulsation. VMs change their size during erection and detumescence.

Patients are very sensitive to this, and considerable distress and loss of self-esteem can result⁽¹⁾. The main reason for seeking medical treatment is cosmesis to correct these deformities and restore a normal-looking penis without compromising anatomical integrity and functional ability.

The glans penis consists of squamous epithelium, lamina propria, and corpus spongiosum.

The lamina propria has a 1-3-mm thick connective tissue layer containing vessels, lymphatics, and nerves. The corpus spongiosum consists of an 8-10-mm thick layer of erectile tissue with vessels, smooth muscle, and nerves⁽³⁾. Although VM of the glans penis arises from lamina propria and corpus spongiosum just underneath the epithelium. It is

important to remove or collapse VM to keep the surface of the glans penis smooth.

Generally, treatment of vascular malformations requires sclerotherapy and/or surgical excision in the specialty center of vascular anomalies⁽¹⁾. Sclerotherapy usually needs multiple sessions with or without radiation⁽⁴⁾. If they are multiple and or endophytic, microsurgical excision with glanuloplasty and urethral meatoplasty requires to reserve the smooth surface of the glans penis⁽⁵⁾. Additionally, the neodymium: yttrium-aluminum-garnet (Nd-YAG) laser is reported a good candidate to treat this condition. **This laser emits light at 1064 nm and ablates deeper lesions in various organs.** In 1993, Jimenez-Cruz reported the first case to treat VM of the glans penis successfully using Nd-YAG laser, which offers tissue penetration to about 5 mm and can coagulate and collapse deep vascular lesions⁽⁶⁾.

Since there are small case series reporting excellent cosmetic results without relapse in the long term, there is no technical guide regarding VM ablation by Nd-YAG laser⁽⁷⁾.

Between 2011 and 2019, Nd-YAG laser treatment was done for six adolescent and young adult patients aged mean 16 ± 4 (11-22) with VM of the glans penis. All of the patients complained of deformity of the glans penis during erection and desired its surgical correction. To project Nd-YAG laser energy into the VM homogeneously, and to shrink the mass uniformly, we developed a novel protocol to irradiate the target at spots 5 mm apart from one another.

Every 5mm Nd-YAG laser irradiation (figure)

All procedures were carried out under general anesthesia.

1. The largest diameter of VM ranged from 5 to 13mm. Mark the border between VM and normal glans penis. Manual compression of the root of the penis can reveal the VM.

2. Determine irradiation points 5 mm apart on the surface of the VM.

3. Irradiate with Nd-YAG laser (VersaPulse® PowerSuite 80/100W Holmium and Nd: YAG, Lumenis, USA) at the marked points until VM is collapsed and flattened.

Lower energy power (15-20W) for 0.5-1 seconds is recommended to prevent too much burn. The total amount of power was median 250 ± 174 J (150-670). Supporting video demonstrated surgical procedure of case 2 with endophytic venous malformation of the glans penis.

4. Apply antibiotic-containing ointment to the irradiated area.

5. Pull back the foreskin to protect the irradiated surgical wound.

Two weeks postoperatively, the irradiated site becomes ulcerative. Daily bathing and topical antibiotic ointment are recommended until the ulcer disappears around 3 months postoperatively.

6. Two weeks later postoperatively, the surface of the glans penis showed ulcer in

limited cases (cases 2 and 4).

7. More than 3 months later postoperatively, the surface of the glans penis showed a smooth surface without deformity in all.

Because there were no relapses of VM after this irradiation therapy, additional treatments were unnecessary. The postoperative surface of the glans penis was completely smooth without deformity in all the patients. **To treat endophytic VMs of the glans penis (case 1,2,4,6), Nd-YAG laser is feasible to ablate them deeply and completely.** We, therefore, conclude that every 5mm Nd-YAG laser treatment method for localized VM yields excellent cosmetic results without relapse in the long term: median 5.5 years (18-124 months). **To confirm the superiority of Nd-YAG laser, pre and postoperative questionnaires regarding cosmesis and function would be needed.**

Conflict of Interest

None declared.

References

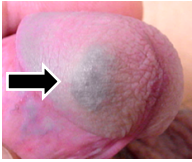



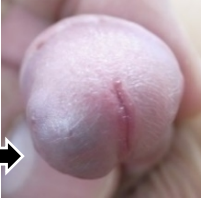
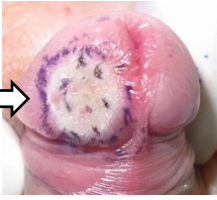

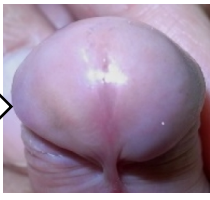

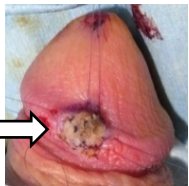
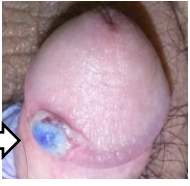


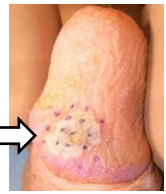
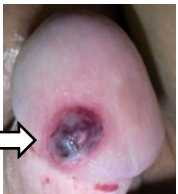
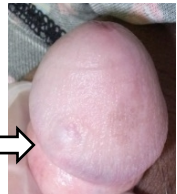

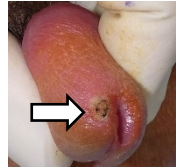
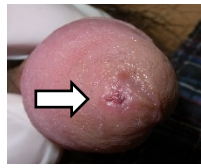
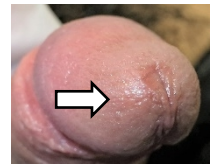
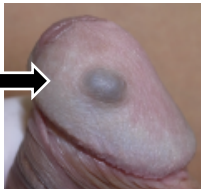
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Figure Legends

Preoperative and postoperative appearance of venous malformation of the glans penis

Supporting video

The eleven-year-old boy underwent every 5mm Nd-YAG laser irradiation for endophytic venous malformation of the glans penis, sized 12mm. Nd-YAG laser was irradiated at the marked points until VM was collapsed and flattened. Lower energy power(15-20W) for 1 second was used to prevent too much burn. The total amount of power was 200J.

	age at OP (years old)	size (mm)	pre OP	Energy (J)	post OP		
					immediately after	two weeks later	> 3 months later
1	15	10		150			
2	11	12		200			
3	22	11		300			
4	14	13		670			
5	15	5		470			
6	20	7		170	