Successful delayed treatment of acute glans penis ischaemia after adult circumcision: a case report

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Keywords
Anticoagulation; Case report; Hyperbaric oxygen; Surgery; Tadalafil

Abstract

(Lo K, Katz D, Chan V, Millar I. Successful delayed treatment of acute glans penis ischaemia after adult circumcision: a case report. Diving and Hyperbaric Medicine. 2023 June 30;53(2):151–154. doi: 10.28920/dhm53.2.151-154. PMID: 37365134.) Penile glans ischaemia post-circumcision is very rare. A 20-year-old male presented with glans ischaemia following an elective circumcision and was successfully treated with a combination of subcutaneous injection of low molecular weight heparin 0.5 mg·kg^{-1} twice-daily, oral Tadalafil 5 mg once-daily for three days and 12 hyperbaric oxygen treatments at 243 kPa (2.4 atmospheres absolute) beginning 48 hours after the onset of ischaemia.

Introduction

Circumcision is a commonly performed surgical procedure in Australia. A 2010 survey estimated 33% of Australian males under 30 years of age were circumcised.[1] Circumcision is a safe procedure with an associated complication rate of 1% when performed by specialist physicians.[2] Complications include bleeding, wound infection, and cosmetic concerns. Ischaemia or necrosis of the glans penis is considered one of the rarest complications.[3] Reported precipitants for glans penis ischaemia include vasoconstrictor infiltration with local anaesthetics, arterial vasospasm during dorsal nerve block application, excessive use of monopolar diathermy, inadvertent blood vessel ligature, and a tourniquet effect from tight dressings or suture lines.

We present a case of a 20-year-old with acute glans ischaemia following an elective circumcision which, despite presenting 48 hours after the onset of ischaemia, was successfully treated with a combination of subcutaneous injection of low molecular weight heparin (LMWH), oral tadalafil, and hyperbaric oxygen treatment (HBOT).

Case report

The patient gave consent for the case and photos to be presented in this report.

An otherwise fit and well 20-year-old man was referred to the hyperbaric medicine department with dusky discolouration of the glans penis two days following an elective circumcision for phimosis. The operation had been performed by a urological surgeon with a subspecialty interest in andrology and penile surgery and was very experienced in circumcision technique. It was performed via an athermal sleeve technique under general anaesthesia. Bipolar diathermy was only used for haemostasis. Shortly after the foreskin was excised and before sutures were placed, discolouration developed on the glans and residual inner layer of foreskin. The wound was closed with interrupted tension-free 4-0 Vicryl Rapide™ sutures in two layers (dartos and skin). A ring block using 15 ml of 0.75% ropivacaine with no adrenaline was administered following closure of the wound. The blue-purple discolouration progressed over the next hour and was noted to be present on discharge despite no dressing being placed. At all times the glans were warm to touch and the patient expressed no significant discomfort.

The patient was advised to contact the surgeon within 24–48 hours if the discolouration had not improved. At 48 hours, it was persistent and had not changed appreciably compared to the immediate post-operative period (Figure 1). The glans were still warm to touch with no significant discomfort noted. At that point, the patient was referred to the local HBOT unit.

Figure 1
Image of penis pre-treatment with signs of oedema and ischaemia

Figure 2
Image of penis immediately following the first HBOT session

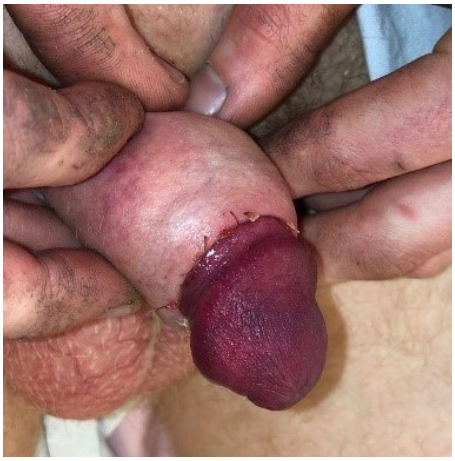


Figure 3
Image of penis following 12 HBOT sessions with residual areas of discolouration

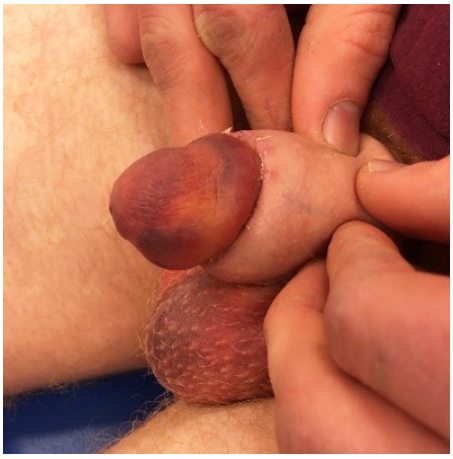
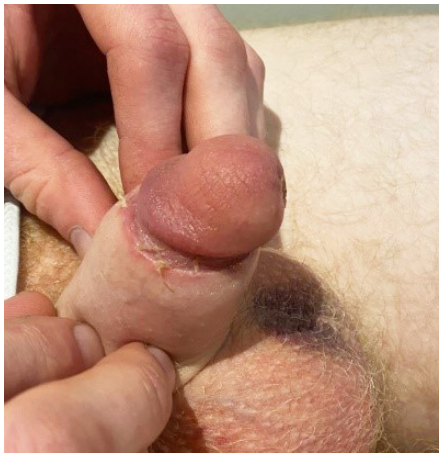


Figure 4
Image of penis at one week clinic follow-up with marked improvement



The decision was taken to commence immediate HBOT with twice-daily 0.5 mg·kg^{-1} subcutaneous LMWH injections (enoxaparin) and once-daily oral 5 mg tadalafil. On breathing oxygen after pressurization to 243 kPa (2.4 atmospheres absolute), the appearance of the glans significantly improved, although the improvement was initially patchy (Figure 2).

The patient received three hyperbaric treatments in the next 24 hours, two the following day with daily treatment thereafter. A total of 12 hyperbaric treatments were given in a monoplace chamber over eight days. Tadalafil was ceased after three days. Twice-daily LMWH was continued until the end of treatment.

At discharge, the patient had residual but much reduced patches of discolouration on the glans with an overall markedly improved appearance (Figure 3). On review in the urology clinic after one week, there was near total resolution of glans discoloration (Figure 4) with no areas of skin loss. The patient reported no erectile or sexual dysfunction.

Discussion

Although penile glans ischaemia is a rare but well described complication of circumcision, the aetiology is unclear. Many of the reports and studies in the literature involve paediatric patients rather than adults. Reported outcomes of glans ischaemia ranges from transient superficial ischaemia to glans necrosis and amputation with subsequent meatal stenosis and urethral stricture.[4] The resultant functional and cosmetic impact to patients may be devastating.

The possible aetiologies of penile glans ischaemia may relate to the use of the local anaesthetic agents, surgical technique, cautery type, and infection.

A dorsal penile nerve block (DPNB) is usually achieved with a ring block or infiltration at the pubic symphysis level or a combination of both techniques. Although DPNB has had a reported complication rate as low 0.23%,[5] subsequent glans ischaemia has been reported.[6,7] Potential causes include large volume local anaesthetic or haematoma formation compressing the dorsal penile arteries, endothelial damage and vasospasm resulting from needle insertion as well as the concurrent infiltration of vasoconstrictor agents with local anaesthetic.

A number of circumcision techniques are described. Clamping techniques, more commonly used in the paediatric population include the Morgen clamp, Gomco clamp or Plastibell devices, whilst open surgical techniques used in any age group include the guillotine technique, dorsal slit or sleeve technique. Less common techniques include thermal energy or laser cutting. Glans necrosis has been reported with cautery using Gomco clamps or an incorrectly sized Plastibell ring.[8] Tight suture lines and compression dressings may exacerbate ischaemia. Monopolar cautery delivers more electrical energy compared with bipolar cautery with reported cases of penile necrosis in paediatric patients following monopolar cautery. A large retrospective study examining 100,157 male paediatric circumcisions performed in US army hospitals reported infection as an uncommon complication (0.06%).[9]

The circumcision technique in our patient was an athermal sleeve technique using bipolar electrocautery with an appropriate volume ring block and there was no haematoma evident. At all times the glans felt warm to touch. The sutures were placed in a tension-free, interrupted fashion without any clinical signs of infection initially and throughout his recovery.

Unfortunately, despite all due care and diligence to reduce the risk of ischaemia, penile glans ischemia still occurred in our patient. Without any readily identifiable risk factors, and no deviation from standard operative technique, the cause of ischaemia in our patient is unknown.

There is a paucity of good evidence-based guidance and consensus on the treatment of glans ischaemia. Reported treatments in case reports and case series include HBOT,[10] phosphodiesterase inhibitors such as pentoxifylline[11] and tadalafil,[12] intravenous alprostadil,[13] antiplatelets, corticosteroids, LMWH, topical testosterone,[14] and caudal anaesthesia.[15,16] One study reported success with LMWH treatment for a paediatric patient with severe glans ischemia 24 hours post-circumcision.[16] Although no adult literature existed for this intervention, we considered it reasonable to treat our patient with LMWH.

We initially commenced tadalafil, a phosphodiesterase-5 (PDE5) inhibitor in our patient based on its reported success in treatment of penile glans necrosis in conjunction with IV pentoxifylline.[12] We ceased this after three doses because of apparent visual improvement in perfusion of the glans penis following HBOT. It is possible that some of the initial improvement in perfusion could be attributed to the PDE5 inhibitor.

There is a large body of experimental and clinical evidence on the use of HBOT to support and enhance the survival of compromised grafts and flaps. Mechanisms of action include reduction of hypoxic insult, enhancement of fibroblast and collagen synthesis, neovascularisation, closure of arteriovenous shunts and positive effects on microcirculation.[17,18] A review on the use of HBOT for flaps and grafts included 957 HBOT patients with 583 control patients encompassing 23 clinical trials (16 controlled trials and 12 randomised controlled trials). The results showed a strong positive result favoring survival in HBOT compared to controls, especially in patients treated 72 hours post-surgery. Of note, there have been reports of success with HBOT in treating ischaemia in other at-risk areas similar to the glans penis. Case reports of necrosis of the nasal areas following trauma or cosmetic hyaluronic filler injection,[19] or amputated finger tips[20] highlight the adjunctive benefit of HBOT in tissue salvage, especially in conjunction with surgery.

Our patient was commenced on treatment 48 hours after the onset of ischaemia. Whilst there is a paucity of published literature on delayed HBOT for penile glans ischaemia, experimental work on animal models demonstrated improvement in the survivability of skin flaps with delayed HBOT.[21] A retrospective analysis showing improvement of ischaemic mastectomy flaps with HBOT had a median time to start HBOT of three days.[22]

Although there are reports of the use of HBOT in conjunction with surgery or pentoxifylline,[10] there are no reports of successful treatment of penile glans ischaemia utilising a combination of HBOT, LMWH and a PDE5 inhibitor. This case demonstrates that despite a treatment delay of 48 hours, this combination of therapies has been associated with a full resolution.

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Acknowledgments

We thank all the staff at the Department of Intensive Care and Hyperbaric medicine, Alfred Health for the support and use of the facilities. We thank all the staff at Men's Health Melbourne for their care of the patient. We thank Dr Victoria Bion for useful feedback and discussions.

Conflicts of interest and funding: nil

Submitted: 11 December 2022
Accepted after revision: 4 March 2023