

Superselective Embolization in Posttraumatic Priapism with Glubran 2 Acrylic Glue

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Abstract

Two patients with posttraumatic priapism underwent transcatheter embolization using microcoils, resulting in temporary penile detumescence and an apparent resolution of the artero-venous fistula. In both cases, priapism recurred 24 hours after the procedure and was successfully treated through selective transcatheter embolization of the nidus using acrylic glue (Glubran 2). The patients showed complete recovery of sexual activity within 30 days from the procedure and persistent exclusion of the artero-venous fistula after a 12-month follow-up.

Key words: Priapism—Posttraumatic—Fistula—Embolization—Glubran 2—Coils

Priapism is defined as a prolonged penile erection not related to sexual arousal, often causing pain [1]. There are two types of priapism: the more frequent low-flow priapism associated with a veno-occlusive pathogenesis and the less frequent high-flow post-traumatic priapism. Low-flow priapism is a medical emergency due to ischemic damage of the corpora cavernosa causing fibrosis and impotence [2]. High-flow priapism is the consequence of direct perineal or penile trauma with laceration of a cavernosal artery, causing direct blood flow into the cavernosal sinusoids with exclusion of the high-resistance helicine arterioles [1]. The late onset of posttraumatic priapism is due to the early formation of a blood clot at the site of the arterial lesion. Subsequent nocturnal penile tumescences and the action of physiological anticoagulant agents cause mobilization of the clot itself establishing the artero-venous fistula (AVF) and resulting in the prolonged penile erection. We present two patients with posttraumatic priapism who underwent embolization with microcoils, with recurrence of the AVF after 24 h, and were definitely treated with superselective embolization using acrylic glue (Glubran 2).

Case Report

Case 1

As a consequence of a snowboard accident, a 26-year-old man suffered perineal trauma developing a painful penile swelling. After a few days the symptoms resolved. Two months later, the patient developed painless penile erection in the absence of hematoma. The physical examination demon-

strated the presence of fully tensed corpora cavernosa. A Color-Doppler US examination revealed the presence of a right bulbo-cavernosal fistula with increased flow velocity within the only feeding branch (Fig. 1A).

The right internal pudendal artery was catheterized left transfemorally with a 4 Fr introducer sheath (Radiofocus; Terumo Japan) and 4 Fr Cobra C3 diagnostic catheter (Radiofocus; Terumo Japan). The diagnostic angiography revealed the presence of an artero-venous nidus in correspondence with the right corpus cavernosus due to a right bulbo-cavernosal fistula with a single supplying vascular branch. The superselective catheterization of the feeding branch was attempted, though the microcatheter (SP; Terumo Japan) could not be advanced through the right bulbourethral artery because of an acute angulation of the vessel. The selective left internal pudendal arteriography performed by right transfemoral approach using the above materials confirmed the presence of the AVF and was accessible for catheterization (Fig. 1B). A microcatheter (SP; Terumo Japan) was introduced into the diagnostic catheter and advanced through the left bulbourethral artery into the feeding branch (Fig. 1C). The branch was embolized using a 5 mm × 0.018 inch straight microcoil (Target; Boston Scientific). The immediate postprocedural bilateral selective internal pudendal arteriography showed complete resolution of the AVF with optimal flow within the cavernous, bulbourethral and dorsal penile arteries bilaterally, in addition to the absence of any other feeding branches (Fig. 1D). A second angiography 30 minutes later with a Color-Doppler US performed 4 hours after the procedure confirmed the resolution of the AFV (Fig. 2A).

The patient developed a gradual penile detumescence, however, 24 hours after the procedure a frank priapism was observable. The Color-Doppler US revealed the presence of floating thrombus within the nidus and an intermittent blood flow from the feeding branch (Fig. 2B). The DSA, repeated by the right transfemoral approach, revealed the recurrence of the AVF with patency of the previously embolized supplying branch, despite the correct positioning of the microcoil (Fig. 2C).

The supplying branch was superselectively catheterized using a microcatheter (SP; Terumo Japan) which, however, could not be advanced distally to the microcoil. A small amount of contrast agent was thereby gently injected to confirm the presence of antegrade flow and the optimal volume of acrylic glue required for embolization of the nidus. The nidus was then embolized by injecting 0.10 ml of Glubran 2 (GEM Srl, Viareggio, Italy) acrylic glue mixed with 0.10 ml of lipiodol (1:1 ratio) to enable fluoroscopic visualization (Fig. 2D). The bilateral selective internal pudendal arteriographic control carried out immediately and 30 minutes after the procedure confirmed the complete devascularization and thrombosis of the nidus with physiological blood flow within the cavernous, bulbourethral and dorsal penile arteries bilaterally (Fig. 2E). After the procedure the patient developed a gradual penile detumescence with complete resolution of priapism within 3 days. Control Color-Doppler US examinations performed 1, 5, 30 days, and 6 and 12 months after the procedure confirmed the absence of the AVF. Sexual activity was completely recovered after 30 days.

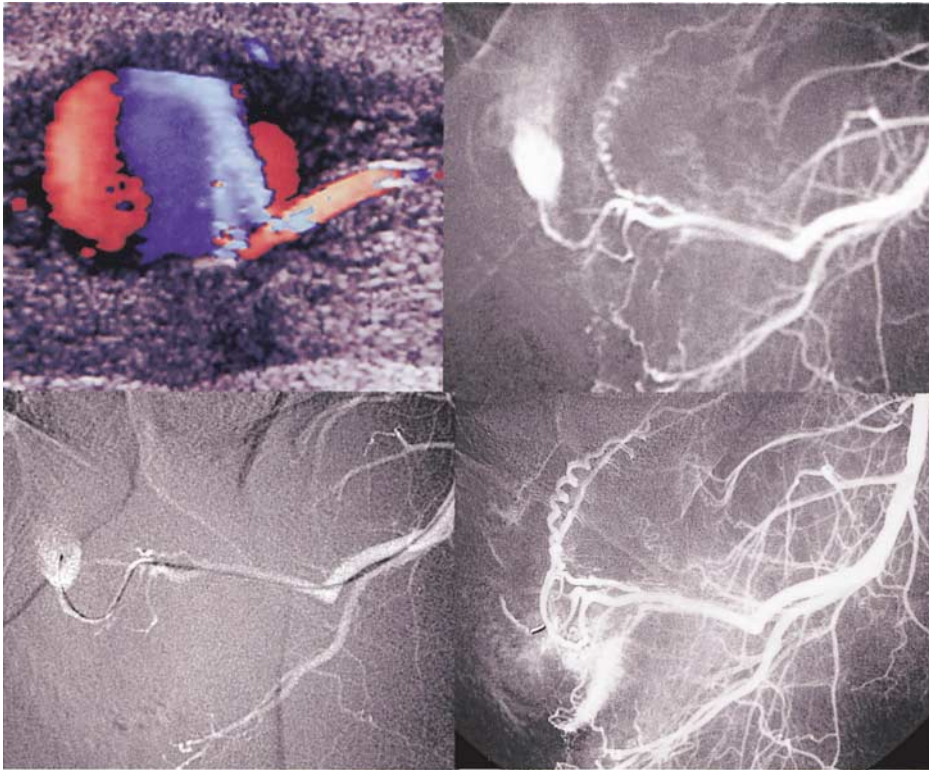


Fig. 1. **A)** Color-Doppler US showing the presence of a right bulbo-cavernosal fistula. **B)** DSA of the left internal pudendal artery confirming the presence of an artero-venous nidus in correspondence with the right corpus cavernosus due to a bulbo-cavernosal fistula with a single supplying vascular branch. **C)** Superselective catheterization and embolization of the feeding branch using a 5 mm × 0.018 inch straight microcoil (Target; Boston Scientific). **D)** Postprocedural selective left internal pudendal arteriography showing the complete resolution of the AVF with optimal flow within the left cavernous, bulbourethral and dorsal penile artery.

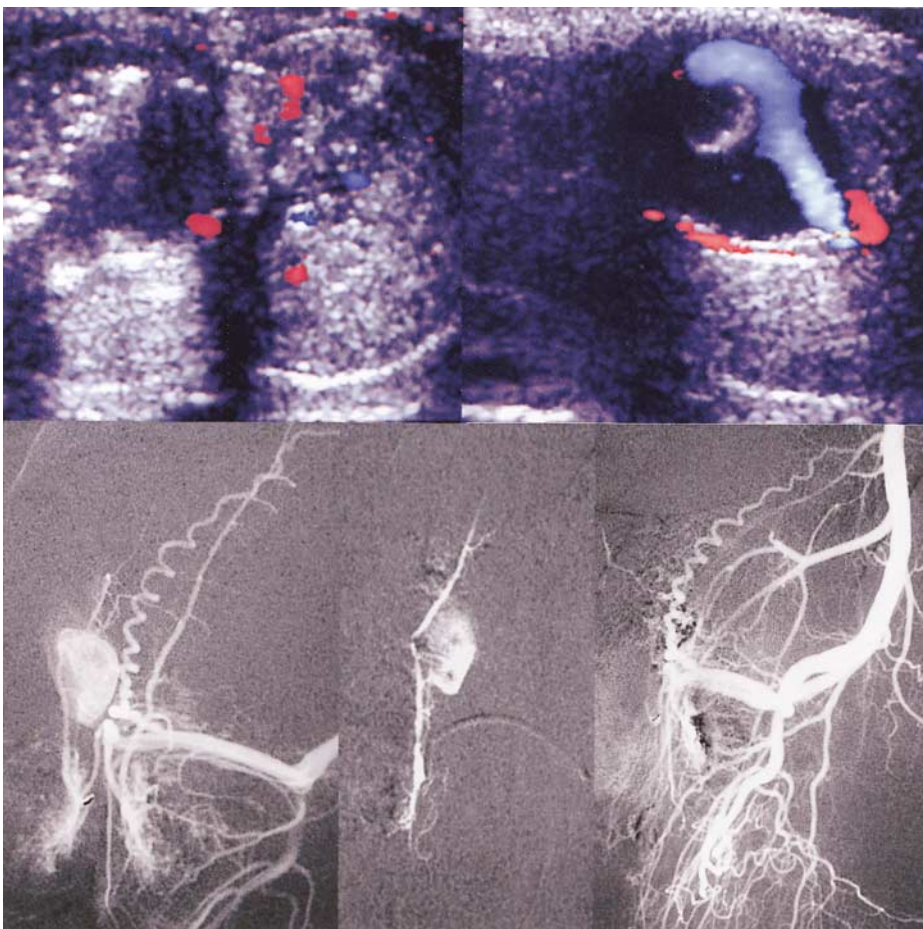


Fig. 2. **A)** Color-Doppler US performed immediately after coil embolization demonstrating the complete resolution of the AVF. **B)** Color-Doppler US performed 24 h after the procedure revealing the presence of a floating thrombus within the nidus and an intermittent blood flow from the feeding branch. **C)** Selective left internal pudendal arteriography revealing the recurrence of the AVF with patency of the previously embolized supplying branch. **D)** Superselective catheterization of the feeding branch and embolization of the nidus with 0.10 ml of Glubran 2 acrylic glue mixed with 0.10 ml of lipiodol. **E)** Post-procedural selective left internal pudendal arteriography confirming the complete devascularization and thrombosis of the nidus with normal visualization of the left cavernous, bulbourethral and dorsal penile artery.

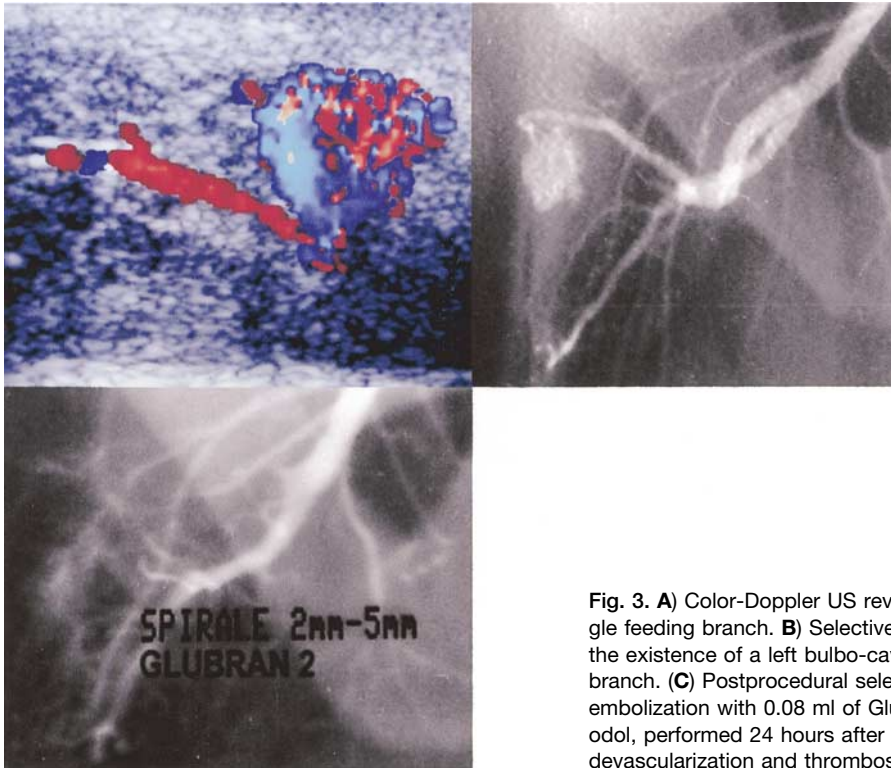


Fig. 3. **A)** Color-Doppler US revealing a left bulbo-cavernosal AVF with a single feeding branch. **B)** Selective left internal pudendal arteriography confirming the existence of a left bulbo-cavernosal AFV supplied by a single feeding branch. **C)** Postprocedural selective left internal pudendal arteriography after embolization with 0.08 ml of Glubran 2 acrylic glue mixed with 0.08 ml of lipiodol, performed 24 hours after coil embolization confirming the complete devascularization and thrombosis of the nidus.

Case 2

A 24-year-old man developed a painful penile swelling after a ski accident, causing perineal trauma. Five days after the trauma, the patient experienced a gradual increase in penile tumescence, resulting in an enduring painless penile erection in the absence of hematoma. Physical examination showed fully tensed corpora cavernosa and Color-Doppler US revealed a left bulbo-cavernosal AVF with single feeding branch (Fig. 3A). A diagnostic angiography performed by right transfemoral approach with catheterization of the left internal pudendal artery using a 4 Fr introducer sheath (Terumo; Japan) and 4 Fr Cobra C3 diagnostic catheter (Radiofocus; Terumo Japan) showed the existence of a left bulbo-cavernosal AVF (Fig. 3B). The nidus presented a single supplying branch.

The feeding branch was superselectively catheterized with a microcatheter (SP; Terumo Japan) and embolized with a 3×2 mm spiral microcoil (Tornado; Cook Inc. Canada). The immediate postprocedural bilateral selective internal pudendal arteriography demonstrated the resolution of the AVF with physiological blood flow within the cavernous, bulbourethral and dorsal penile arteries bilaterally and no contralateral feeding branches. A second angiography performed 30 minutes later and a Color-Doppler US performed 4 hours after the procedure confirmed the resolution of the AVF.

The patient underwent a partial penile detumescence with recurrence of penile erection after 24 hours. Color-Doppler US revealed patency of the feeding branch with turbulent flow within the AVF. A selective left internal pudendal arteriography performed by right transfemoral approach confirmed the persistence of the AVF with flow within the supplying vessel. No other ipsilateral or contralateral feeding branches were detected.

The nidus was embolized with a mixture of 0.08 ml of Glubran 2 (GEM Srl, Viareggio, Italy) acrylic glue and 0.08 ml of lipiodol (1:1 ratio) injected with a microcatheter (SP; Terumo Japan) advanced through the diagnostic catheter to the microcoil in the feeding branch. The bilateral selective internal pudendal arteriography performed immediately and 30 minutes after the procedure confirmed the complete devascularization and thrombosis of the nidus with physiological blood flow within the cavernous, bulbourethral and dorsal penile arteries bilaterally (Fig. 3C). The patient underwent gradual penile detumescence with complete resolution of the

symptoms within 5 days. The Color-Doppler US examinations performed 1 day, 30 days and 6 and 12 months after the procedure confirmed the absence of the AVF. Sexual activity was completely recovered after 35 days.

Discussion

Posttraumatic priapism is a fairly uncommon cause of priapism, usually caused by direct perineal or penile trauma. The occurrence of a bulbo-cavernosal fistula causes a high arterial flow within the lacunar spaces, bypassing the high-resistance helicine arteries [3, 4]. Diagnosis is usually suspected on the basis of the history of trauma and physical examination. When such a suspicion exists, confirmation may be obtained through arterial blood aspiration from the corpora cavernosa. On the other hand, a precise determination of the number, location and lateralization of the arterial lacunar fistulas may be obtained using Doppler-US. In addition, in case of high-flow priapism, this noninvasive exam can show the increased flow velocities in the cavernosal artery that are above the characteristic velocities of a normal erection [5].

Posttraumatic priapism is treated with conservative therapy including perineal ice-pack compression, intracavernosal α -agonist agents or methylene blue injections. If conservative therapy fails an invasive alternative such as surgical internal pudendal artery ligation or selective transcatheter embolization may be employed. Surgery is, however, associated with a high risk of impotence or partial erection in the long term [6, 7].

The first successful radiological treatment of high-flow priapisms was reported in 1977 by Wear et al. [8–11] in a 26-year old man who underwent selective embolization using autologous blood clot. This technique has proven to be safe, feasible and effective in most cases, however, some authors report the occurrence of thrombolysis followed by recurrent priapism, requiring reintervention [12, 13]. An advantage of this technique is represented by the

reconstitution of normal arterial flow after slow physiological dissolution of the clot, reducing the risk of impotence [14]. Nevertheless, cases of permanent arterial occlusion and impotence using autologous clot are reported in the literature [15]. When complete procedural success is achieved, erectile recovery is obtained only after several months [8, 12, 13].

Gelfoam has been shown to be effective for treating high-flow priapism, however, it enables the reconstitution of normal blood flow in a manner similar to autologous clot and shares with the latter the drawback of not being radiopaque, and thereby not allowing precise control of embolization [9, 16–18]. Gelfoam may be considered useful in the treatment of high-flow bilateral priapism where recanalization of the embolized artery is important since no collateral blood flow is available from the contralateral side [19].

Embolization using straight and spiral microcoils has been reported only in a few cases [12, 18, 20, 21]. The disadvantages of this technique are its permanent nature and the usual need of more than one microcoil for complete occlusion of the branch. The use of microcoils in small caliber vessels frequently determines spasm with an apparent occlusion of the feeding branch at the immediate post-procedural DSA control. The subsequent resolution of this spasm favors the recurrence of the AVF which can require the use of several microcoils to obtain the permanent occlusion of the feeding branch. In fact, during the physiological nocturnal penile tumescence, the vasodilation of the embolized branch, in addition to the endogenous lysis of the thrombus, may cause recurrence of priapism. Furthermore, in case of additional branches supplying the AVF, several microcoils may be required for optimal treatment. In addition, even when several feeding branches exist, the preliminary angiography frequently demonstrates the presence of a single branch due to blood flow predominance in the latter.

N-butyl-Cyanoacrylate (NBCA) is a monomer acrylic glue which rapidly polymerizes when in contact with ionic media such as blood and causes a permanent occlusion. To avoid adherence to the tissue of the thin catheters required for the superselective embolization, NBCA has to be injected through a catheter washed with a 5% dextrose solution and the catheter has to be withdrawn promptly after injection [1, 22]. The technique requires considerable expertise; there is also the risk of undesired embolizations. Moreover, NBCA polymerizes with an exothermic reaction, causing pain to the patient.

Glubran 2 (GEM Srl, Viareggio, Italy) is an acrylic glue bearing a CE mark authorized for surgical and endovascular use in neuro-radiology. The comonomer of Glubran 2 comprises a monomer of NBCA and a monomer of MS (owned by GEM Srl). MS allows the monomer of NBCA to polymerize with a lower exothermic reaction (45°C) and a slightly longer polymerization time [23]. Compared to the monomer NBCA, the Glubran 2 causes less pain to the patient and is associated with a lower risk of adherence of the catheter to the tissue, hence showing a greater ease of use. Differently, acrylic glues, once deposited into the nidus, determine its permanent occlusion and prevent its replenishment through feeding branches.

In the two cases presented here, the microcoil caused an initial vascular spasm of the small feeding branch which was erroneously interpreted as the successful embolization of the latter. In both patients, the complete occlusion of the feeding vessel observed at the immediate postprocedural angiography was confirmed by a second angiography performed 30 minutes after embolization and by Color-Doppler US performed 4 hours after the procedure. The subsequent recanalization of the feeding branch, which occurred 24 hours after the procedure, might have been determined by the

physiological nocturnal penile tumescence, causing vasodilation of the embolized vessel along with the endogenous lysis of the thrombus.

During microcoil embolization, the placement of additional microcoils could have favored the durability of the occlusion, however, it would have also exposed the patient to an increased risk of nontarget artery embolization. In fact, additional microcoils could have only been placed more proximally to the first, increasing the probability of dislocation from the target site. To avoid possible further recurrences of the AVF and reduce the risk of undesired embolizations using microcoils, in both cases we preferred the direct embolization of the nidus using Glubran 2.

Although, according to the literature, the use of permanent embolic materials should be reserved for cases with recurrent priapism after an initial success with absorbable embolic agents [24], we believe that primary embolization using acrylic glues such as Glubran 2 is safe, feasible and more efficient. In fact, in case of absorbable embolic materials the recurrence of priapism is frequent due to recanalization of the AVF following reabsorption, and a long period is required before a complete recovery of the erectile and sexual function is obtained. With microcoils, on the other hand, postprocedural penile detumescence may be associated with vascular spasm which can be erroneously interpreted as a procedural success. Furthermore, when the AVF is supplied by more than one blood vessel, the placement of several microcoils may be needed for complete resolution of the disease, with a consequent higher risk of non-target artery embolization. Differently, acrylic glues may also be deposited directly into the angiographic nidus corresponding to the AVF, thus at once permanently excluding the pathological communication regardless of the number of feeding branches.

Compared to other acrylic agents, Glubran 2 presents a greater ease of use, causes less discomfort to the patient and is the only acrylic glue bearing a CE mark. Glubran 2 enables the direct embolization of the arteriovenous nidus and should be regarded as a valid alternative in the treatment of posttraumatic priapism; however, expertise is required to prevent undesired embolizations.

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