

Post-traumatic Arterial Priapism : Doppler Ultrasonographic Findings and Therapeutic Embolization¹

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Two cases of post-traumatic arterial priapism diagnosed with duplex and color Doppler ultrasonography showed pseudoaneurysm and increased peak systolic and diastolic velocity of the inflowing cavernosal artery (low resistance index). An autologous blood clot successfully controlled tumescence and was comfortable and secure in preventing necrosis and impotence.

Index Words : Arteries, therapeutic blockade
Penis, angiography
Penis, US

Priapism is an uncommon condition of prolonged erection without sexual excitement or desire. Without appropriate treatment, sequelae such as penile necrosis, fibrosis and impotence remain major problems (1).

Hemodynamically, priapism is caused by an imbalance between arterial inflow and venous outflow, and is divided into the low-flow or venous occlusive, ischemic type and the high-flow or arterial, non-ischemic type. In the former, venous outflow is impeded by persistent contractions of the smooth muscle fiber at the level of the trabeculae in the corpora cavernosa. In the latter, there is excess arterial inflow into the corpus cavernosum at the level of the helicine artery and the intimal cushions caused by an unknown nervous dysregulation (2).

Post-traumatic arterial priapism is a kind of high flow type and occurs after traumatic cavernosal artery laceration. From the lacerated cavernosal artery, uncontrolled high flow occurs into the corpus cavernosum and tumescence consequently remains (3).

Classically, priapism may be managed in various ways (1), but because the cause and pathophysiological mechanism is not well understood, the success rate is not constant. In the case of post-traumatic arterial priapism, with occlusion of the lacerated artery the therapeutic result is good (4-9). The diagnosis of

post-traumatic arterial priapism is therefore important. Diagnosis of the arterial laceration has traditionally been based on selective internal pudendal arteriography, but Doppler ultrasonography has recently been used to suggest the lacerated cavernosal artery with its significantly elevated velocity, particularly throughout diastole, when the resistive index is low (7).

We report two cases of post-traumatic arterial priapism. In both, high arterial flow and pseudoaneurysm were identified with color Doppler ultrasonography and were confirmed by internal pudendal arteriography. They were successfully treated by superselective embolization with autologous blood clot.

Case 1

A 38-year-old male had sustained a straddle injury while falling across a piece of ironware. Persistent painless partial tumescence subsequently developed without sufficient rigidity to engage in sexual intercourse, and this rendered the patient impotent for the following six weeks. He then visited our hospital.

On physical examination, the corporeal bodies were partially tumescent and semirigid. Corporeal aspiration blood was bright red and of the high flow, arterial, nonischemic type (pH, 7.431; pCO₂, 40.7 mmHg; pO₂, 81.4 mmHg; O₂ saturation, 96%). Penile color Doppler ultrasonography without using a vasodilator revealed a 12mm-sized pseudoaneurysm with to-and-fro flow within the proximal left corporeal body. Flow velocity of the inflow into the pseudoaneurysm was

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Received August 5, 1996; Accepted October 15, 1996

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greater than that of right normal cavernosal artery. Peak systolic/diastolic velocities were 48/20 cm/sec and 25/0 cm/sec at the left and right cavernosal arteries, respectively. The resistance index was 0.58 at the left inflow artery (Fig. 1A).

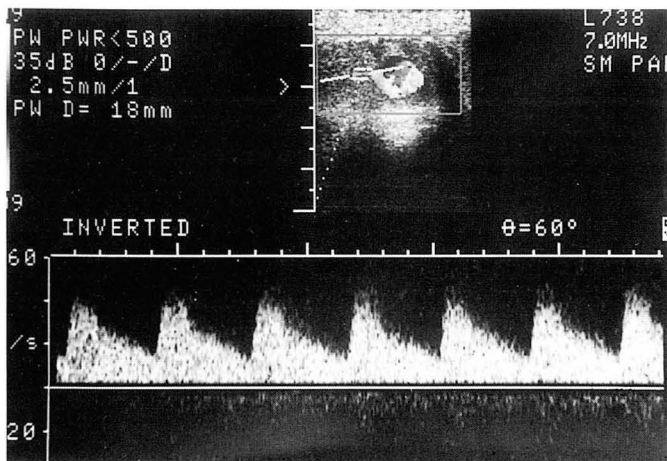
On the 41st day after trauma, left internal pudendal arteriography was performed through the right femoral artery with a 6F cobra catheter (Cook, Bloomington, USA) for arterial embolization. The pseudoaneurysm was seen at the left proximal corpus cavernosum and the left cavernosal artery drained into it (Fig. 1B). The lacerated cavernosal artery was superselected with a 3F Tracker microcatheter (Target Therapeutics, San Jose, USA) through the cobra catheter using a coaxial technique and a 2ml autologous blood clot was injected. Postembolization angiography demonstrated the disappearance of the pseudoaneurysm (Fig. 1C). Rapid detumescence occurred while the patient was still on the arteriogram table.

On the seventh day after embolization, Doppler ultrasonography revealed the disappearance of the pseudoaneurysm and the flow spectrum of the left site

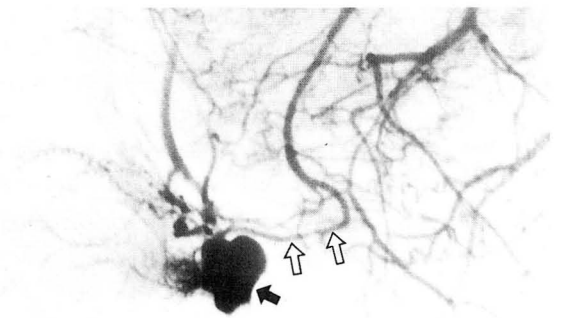
was equal to the right site (peak systolic velocity : 25 cm/sec ; end diastolic velocity : 0 cm/sec). On the 40th day after embolization, a locally rigid nodule remained without tumescence. Intercourse was possible with 40 % of normal erection.

Case 2

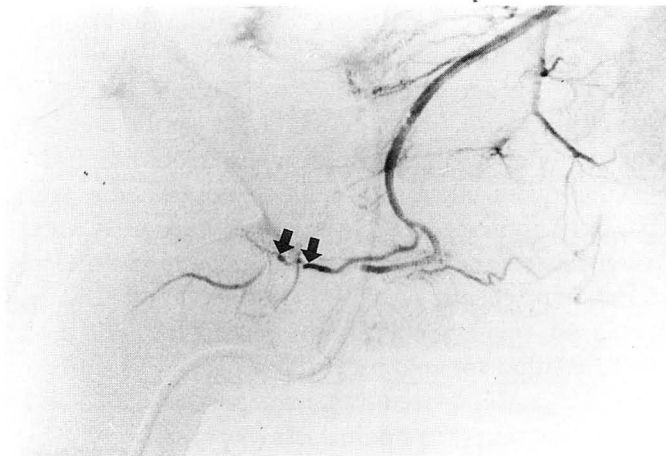
An unmarried 25-year-old male had sustained a straddle injury to the perineum and scrotum and tumescence developed on the next day. Right internal pudendal arteriography performed at a local hospital on the 22nd day showed a pseudoaneurysm. Before performing left internal pudendal arteriography, embolization with gelfoam at the right common penile artery was performed inadvertently (We reviewed the angiographic film and asked the hospital about the procedure). Left internal pudendal arteriography was then performed and the previous pseudoaneurysm was still opacified from the left cavernosal artery, probably due to collateral circulation between both penile arteries. Without further embolization the patient was referred to our hospital.



A



B



C

Fig. 1. A 38-year-old male with penile erection persisting for 40 days after trauma.

A. Doppler ultrasonography shows a 12mm-sized pseudoaneurysm within the proximal left corpus cavernosum and high flow of cavernosal artery throughout diastole.

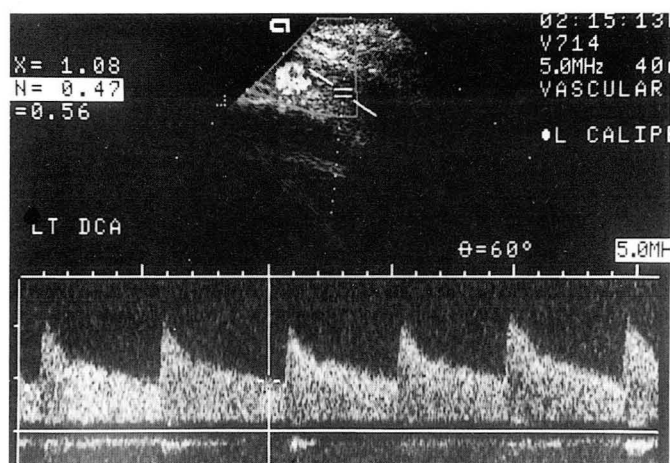
B. Left internal pudendal arteriography reveals the pseudoaneurysm (arrow) into which the cavernosal artery (open arrow) is draining.

C. After embolization with 2ml autologous blood clot, the cavernosal artery was successfully embolized. Dorsal penile artery (arrows) is strictured.

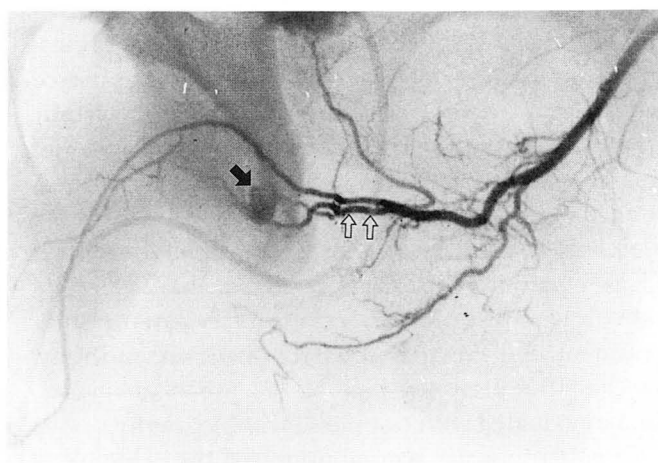
Penile Doppler ultrasonography without a vasodilator revealed a 1×0.6 cm-sized pseudoaneurysm with to-and-fro flow within the proximal left corporeal body. Flow velocity of the artery proximal to the pseudoaneurysm was 108 cm/sec in peak systolic velocity, and 47 cm/sec in end diastolic velocity, with a pattern of low resistance (0.56 resistance index) (Fig. 2A). There was no cavernosal flow in the proximal right corpus cavernosum which had been previously embolized.

On the 35th day, internal pudendal arteriography was performed using the same technique described in case I. On left internal pudendal arteriography, the pseudoaneurysm showed no interval change compared with previous outside arteriography (Fig. 2B). On right internal pudendal arteriography, however, the right common penile artery, which had been embolized, was not opacified and not recanalized after a 13 day interval. Superselective embolization to the left cavernosal artery was carried out using a 4.7 ml autologous blood clot. On postembolization arteriography it was dem-

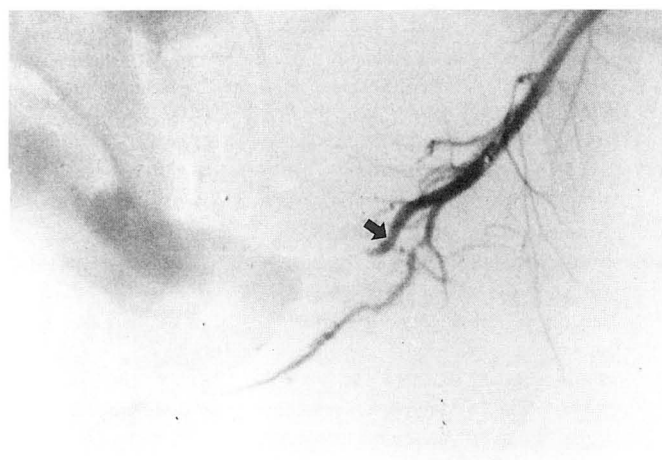
onstrated that blood flow was obstructed at the level of the common penile artery and the pseudoaneurysm was not opacified (Fig. 2C). There was no evidence of penile necrosis, however (8). On the following day, the pseudoaneurysm was echogenic without to-and-fro flow on Doppler ultrasonography. Proximal arterial flow had decreased to 50 cm/sec in peak systolic velocity and 3 cm/sec in end diastolic velocity, with a resistance index of 0.9. On the 59th day after embolization, Doppler ultrasonography showed that the revealed pseudoaneurysm had disappeared, and on the left side, arterial flow was normal. On the right side, however, there was no arterial flow, as in to the previous study. This means that the vessel which had been embolized with gelfoam was not well recanalized. Using Doppler ultrasonography, blood flow was detected in the right corpus cavernosum only at the distal part; it was 17 cm/sec in peak systolic velocity and 0 cm/sec in end diastolic velocity. The penis was detumescent on the tenth day after embolization and was erect in the normal way, with normal potency.



A



B



C

Fig. 2. An unmarried 25-year-old male with inadvertent embolization of right common penile artery.

A. Doppler ultrasonography shows a 10×6 mm-sized pseudoaneurysm within the proximal left corpus cavernosum and high flow velocity of the left cavernosal artery throughout diastole and low resistant pattern.

B. Left internal arteriography reveals cavernosal artery (open arrow) draining into the pseudoaneurysm (arrow).

C. After embolization with 4.7 ml autologous blood clot, cut-off of the common penile artery (arrow) is seen.

Discussion

In order to determine the appropriate therapy, the distinction between venous occlusive priapism and arterial priapism is critical. In radiological diagnosis, it has so far been possible to confirm this distinction using an angiography; a pseudoaneurysm or arteriovenous fistula into the cavernous sinus is revealed (2–6, 8, 9). The accuracy of Doppler ultrasonography in this disorder has not yet been established, through it can confirm post-traumatic arterial priapism through the finding of a pseudoaneurysm and high flow in the inflowing artery throughout diastole (7, 10). Doppler ultrasonography is superior to angiography in evaluating the status of high flow in the inflow artery and in follow-up after treatment. In these two cases, all peak systolic (48 cm/sec, 108 cm/sec) and end diastolic (20 cm/sec, 47 cm/sec) velocities increased and resistance indices (0.58, 0.56) were low (Fig. 1A, 2A). The spectral wave form with a low resistance pattern, a high peak systolic velocity and continuous flow during diastole is consistent with the findings of post-traumatic arteriosinusoidal fistula (7, 10). In case I, a discrepancy between the systolic velocity of the normal right and injured left cavernosal artery was noted (right:left = 25:48 cm/sec). Discrepancies in systolic velocities of the right and left cavernosal arteries greater than 10 to 15 cm/sec may be indicative of underlying arterial disease (10). Although angiography allows us to confirm diagnosis, noninvasive Doppler ultrasonography can diagnose easily and accurately high flow post-traumatic priapism. Follow-up after treatment, the therapeutic effect of decreased inflow rate and the disappearance of the pseudoaneurysm, can be evaluated with Doppler ultrasonography.

In post-traumatic arterial priapism, the principle of treatment is the occlusion of uncontrolled inflow to the pseudoaneurysm and arteriovenous fistula, while preserving normal penile flow and thus preventing the development of impotence. The methods of treatment are surgical ligation or embolization of the cavernosal artery; other treatment is not usually useful. An autologous blood clot, gelfoam and coils have been used as embolic material (2–9). To our knowledge, there have to date been 20 cases confirmed by angiography (2–6, 8, 9) and one confirmed by Doppler ultrasonography (7). Six of these 21 cases were treated with surgical ligation, which corrects the tumescence successfully. Normal potency resulted in three cases, partial potency in two and impotency in one (2, 4, 6, 7). Coils were used in three cases, but were

successful and resulted in potency in only one case. Two cases failed and were corrected with surgery (6). Gelfoam was used in the bilateral cavernosal artery in one case (8), and gelfoam with an autologous blood clot was used in the other case. Both these cases were successful; neither necrosis nor impotence occurred. An autologous blood clot was used in 12 cases, and in all, the tumescence was successfully controlled; in ten, normal potency resulted and in two there was partial erection (3, 5, 9). All methods except coils—namely surgical ligation, gelfoam and autologous blood clot—have had good results in controlling the priapism. In case II, on the following and 59th days after embolization, there was no Doppler signal from the right cavernosal artery, which had been embolized with gelfoam. Flow was preserved in the left cavernosal artery, however; this had been embolized with an autologous blood clot. On the basis of this case, an autologous blood clot which autolyses after 12 or 24 hours is securer and better than gelfoam for the faster restoration of sexual function and prevention of necrosis. In case I, intercourse was possible, with 40% of normal erection. This partial erection was probably caused by a coexistently injured left dorsal penile artery which was not well opacified and strictured (Fig. 1B).

In conclusion, post-traumatic arterial priapism can be diagnosed easily and accurately with Doppler ultrasonography prior to angiography. An autologous blood clot can control the high flow of the lacerated cavernosal artery.

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대한방사선의학회지 1997; 36: 307-311

외상후 동맥성 음경지속발기증: 도플러 초음파 소견 및 자가혈전을 이용한 색전술¹

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곽병국 · 주상신 · 이화연 · 심형진 · 김영구 · 김진상

외상후 동맥성 음경지속발기증은 외상후에 성적 자극이나 의도 없이 음경의 발기가 지속되는 질환으로 적절히 치료되지 않을 경우 음경의 괴사, 섬유화, 발기불능을 초래할 수 있다. 저자들은 2례에서 도플러 초음파검사로 좌측 음경해면체 근위부에 가성동맥류와 저항이 낮은 고혈류를 확인하였다. 색전술을 위한 혈관조영검사에 시도 손상받은 음경해면체 동맥으로부터 음경해면체내로 유입하는 가성동맥류를 확인하였다. 자가혈전으로 성공적으로 색전치료하여 음경지속발기증이 소실되었다.

국제 학술대회 일정표 [II]

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