Multispiral computed pharmacocavernosography in the diagnosis of venoocclusive erectile dysfunction.

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Purpose

Causes of surgical treatment failure for venoocclusive erectile dysfunction (ED) are not only the formation of new collaterals, but also the functioning of residual veins. Thereby, the search continues for a rational diagnostic method that provides an exception early clinical relapse.

Cavernosography technique is not new, by itself. Cavernosography was described for the first time by De la Pena in 1946 [1], as a method for visualizing the pelvic veins, and than 56 years ago, May and Hirtl [2] described a normal x-ray anatomy of the corpora cavernosa, as well as changes that occur during injury, inflammation, tumors of the cavernous bodies, priapism. However, cavernosography in the modern sense of the term was proposed only in 1984 and Virag et al. [3], who performed X-ray study of the corpora cavernosa after the injection of vasoactive drug papaverine, which induce an erection and permit visualise the cavernous bodies in erection state.

Current methods of examination have several disadvantages that prevent their use as a method of topical diagnosis of various forms of vaskulogenic erectile dysfunction. Thus, the study area with Doppler ultrasound of the penis does not allow you to visualize all ways of lateral and proximal venous outflow from the penis; traditional cavernosography can not be digitized, you also can not build three-dimensional images. The frequency of false-positive results when using these methods reaches 20-25% [4].

Many scientists around the world are trying to improve diagnosis of erectile dysfunction. Tus, Kurbatov et al. in 2008 published a study on magnetic resonance imaging in combination with the dynamic infusion pharmacocavernosometry [4]. In Japan, Kawanishi Y, et al. in 2011 [5] described a three-dimensional computer cavernosography in applicants for the ligation of the deep dorsal vein. A study was published [6] in Iran, on the application of computer cavernosography in patients with suspected venoocclusive erectile dysfunction.

The purpose of our study was to determine the status of the corpora cavernosa and the visualization of the veins, which mainly drains the blood from the corpora cavernosa.
Methods and Materials

We studied the significance of dynamic computer pharmacocavernosography (DCP) in the topical diagnosis of the various variations of vaskulogenic erectile dysfunction related to a violation of the venous mechanisms of erection formation. The study was conducted on 88 men with suspected abnormal venous drainage. The mean age was 39.7 ± 6.8 years. DCP used to confirm the diagnosis venoocclusive erectile dysfunction.

Venous "leakage" classified on the basis of the prevalent way of venous outflow. Shunt from the corpora cavernosa fall into three types: distal leakage - in the system of deep dorsal vein (Fig. 1 on page 5), proximal leakage - in a deep penile veins (Fig. 2 on page 5), and mixed type (Fig. 3 on page 6) [7]. To perform a DCP patient is situated on the table of computed tomography in the back with his hands threwed back behind his head. Scanning the patient is carried out in native phase (Fig. 4 on page 7, Fig. 5 on page 8) from the wings of the ilium to the level of the glans penis with breath holding at inspiration. It then an intracavernosal injection of vasoactive medication (Alprostadil, 10 mg) and pharmacodopplerografy of vessels of the penis were performed. The study area is exposed according to the results of scanning in the first phase (from the arc of the bladder to the penis). When the maximum pharmacological response (under the control of the ultrasonic triplex survey conducted to rule out false positive and false-negative CT cavernosography) is achieved in the cavernous body; 10 ml non-ionic low osmolarity radiopaque substance (yopamidol or yodiksanol) was injected, diluted in 40 ml of saline.

Using this concentration allows, on the one hand, optimal contrast cavernous body, avoiding the effect of "overcontrasting", and reduce the trauma of the epithelium of the cavernous tissue by high osmolar solutions, on the other hand. After the injection of ½ volume of the program starts scanning, followed by the injection of remaining ½ volume. A subsequent scan in 50 seconds. after cavernosography. The study is performed via protocol: Pelvis HCT Native; 120KV; 60 mA; Rot. Time 0.5.

Processing of the data, followed by modelling (MPR and 3D reconstruction with angiography program). Data was printed on tape and/or CD/DVD. The state of osteoarticular system is estimated in the "bone" mode with the application of the vascular phase.

The indications for DCP were:

- Ineffective conservative therapy for 6 months
- The planning of surgical treatment.

As with any diagnostic manipulation, DCP has a several contraindications. Absolute contraindications include:
- Allergic reactions to iodine-containing medications
- Illnesses with coagulation disorders
- Inflammation in the cavernous bodies
- Urethro cavernous fistula
- Hyperazotemia (serum creatinine > 130 uM / L)
- Severe bronchial asthma.

Relative contraindications for the study are:

- claustrophobia
- epilepsy
- schizophrenia
- critical condition of the patient
- the patient's inability to maintain immobility during the test.
**Fig. 1:** Dynamic computer pharmacocavernosography. Distal venous drainage with the magistral pathological type.

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**Fig. 2:** Dynamic computer pharmacocavernosography. Proximal venous drainage with the magistral pathological type.

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**Fig. 3:** Dynamic computer pharmacocavernosography. Mixed venous drainage with the magistral pathological type.

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Fig. 4: Dynamic computer pharmacocavernosography. The initial stage of method demonstrates cavernous fibrosis.

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**Fig. 5:** Dynamic computer pharmacocavernosography. Three-dimensional reconstruction. Radiographic signs of proximal cavernous fibrosis.

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Results

After processing the data of DCP were as follows: venous leak was confirmed in 72 (81.8%) patients, pathological shunts between the corpus spongiosum and corpus cavernosum of penis and in 26 (29.5%), sclerosis of cavernous bodies in 19 (21.5%) patients, Peyronie's disease was diagnosed in one (1.14%) patient, abnormal structure of the cavernous pool of the penis in 13 (14.8%) patients. Mixed conditions was observed in 57 (64.8%) patients.

Table 1. Collectors of pathological venous drainage in the cavernous pool in patients with ED.

<table>
<thead>
<tr>
<th>Pathological conditions of the cavernous abs.</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iliac veins of pelvis</td>
<td>49</td>
</tr>
<tr>
<td>Epigastric veins</td>
<td>16</td>
</tr>
<tr>
<td>Intense cavernois fibrosis</td>
<td>12</td>
</tr>
<tr>
<td>Mixed leakage: iliac + epigastric venous pool</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
</tr>
</tbody>
</table>

The highest proportion pathological conditions of the cavernous pool - venous discharge into the iliac vein pelvic (55.7%), the second - in the epigastric vein (18.18%).

During the study we compared the diagnostic value of DCP with other methods of evaluating the state of penile vessels. The following results was obtained (Table 1):

Table 2. Comparative diagnostic value of beam techniques in detecting pathologic venous drainage:

<table>
<thead>
<tr>
<th>Method</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Positive prognostic value (%)</th>
<th>Negative prognostic value (%)</th>
</tr>
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<tbody>
<tr>
<td>PDG</td>
<td>71</td>
<td>85</td>
<td>96</td>
<td>26</td>
</tr>
<tr>
<td>PCG</td>
<td>73</td>
<td>93</td>
<td>92</td>
<td>29</td>
</tr>
</tbody>
</table>
As can be seen from Table 1, among the currently available diagnostic methods for ED, a DCP has the best sensitivity, specificity and other characteristics that determine the diagnostic value of the method.
Conclusion

The advantages of DCP comparing other methods of diagnosis of erectile dysfunction are: high quality of the image, the possibility of constructing three-dimensional models to determine the exact localization of pathological venous leakage (even through the veins of small caliber) without the imposition of bone and other anatomical structures, as well as the use of low-osmolar contrast agent.

However, as any medical technique, DCP has disadvantages, including: the lack of continuous visualization of passage of contrast medium through the vessels during the procedure and the higher cost of the study.

Comparing these data, we can conclude that the efficiency of ultrasonic diagnosis of pathological venous leakage from the cavernous pool is much lower than DCP. In addition, DCP is not only the more presence in the diagnosis of abnormal leakage, but also determines the number of pathological communicating veins, their level and the pool of leakage.

Our studies suggest a DCP is one of the best methods for diagnosis venoocclusive erectile dysfunction because of its low invasiveness and high reliability.
References
