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SURGICAL METHODS OF CORRECTION OF ADRENAL HYPERTENSION

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Annotation
We would like to share our experience of treating 301 patients, sick with genesis of adrenal hypertension, who received inpatient care in the clinic of Tashkent Medical Academy (TMA) within the period from 2000 to 2022, on whom were used the methods of treatment, which are mentioned above. Depending on the type of medical intervention, the patients were categorized into 3 groups. The first group comprised the patients, the process of intervention which was performed through traditional thorocofrenolumbotomic (TFL) access. These ways, for the shown period were performed 104 traditional adrenalectomies in patients at the age from 18 to 66. The second group constituted 47 patients in whom were performed endovascular destruction of adrenal gland (EDAG) for the above indicated period, at the age of 20 to 55.
The third group of patients made up 150 people who were operated through the method of laparoscopic adrenalectomy (LA). Indications to the performance of traditional adrenalectomies were considered hormonally active and non-active adrenal tumors. At that, the size of tumors reaching 1.5 centimeters, especially the ones located on the left side were subject to endovascular destruction of adrenal gland (EDAG). After the implementation of LA, the tumors of the size from 1 to 6 centimeters, were subject to be operated this way, and the traditional way was used only in big size tumors. LA nowadays is the preferred in most of the situations with adrenal gland tumors. Following the principles of adequate behavior of patients on all of the stages of treatment allows the reduction of risk of complications, which contributes to the safety and reliability of operations.
Key words: tumor of adrenal glands, arterial hypertension, laparoscopic adrenalectomy.

According to different researchers, the frequency of arterial hypertension (AH) in general population is up to 30%, and at the same time, the genesis of adrenal hypertension causes from 8 to 14% of cases from all of its symptomatic forms [1]. The main way of treating AH of adrenal genesis, specifically when the origin contains variety of neoplasms, is considered the surgical method [2].

The surgery of adrenal gland is comparatively new branch of clinical medicine that has being developed from the end of XIX- and the beginning of XX century. The characteristics of the location of adrenal gland in the retroperitoneal space determined the difficulty of its search and removal. These difficulties were the main reasons of numerous complications, which in turn were the holding points of development in this sphere [2,3].

One of the attempts of reducing the traumatic outcomes of operative interventions – is the implementation into the clinical practice the method of endovascular destruction of adrenal gland (EDAG) [4].

The injection of laparoscopic adrenalectomy (LA), performed first by Gagner in the year 1992, made it available to avoid problems in traditional adrenalectomy and the number of such medical operations started to increase dramatically [6,7]. Undoubtedly, another reason for

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increased number of medical interventions in adrenal gland is related with high detectability of adrenal tumors.

The material and methods. Depending on the type of medical intervention, the patients were categorized into 3 groups. The first group comprised the patients, the process of intervention which was performed through traditional thorocofrenolumbotomic (TFL) access. These ways, for the shown period were performed 104 traditional adrenalectomies in patients at the age from 18 to 66. The second group constituted 47 patients in whom were performed EDAG for the above indicated period, at the age of 20 to 55. The third group of patients made up 150 people who were operated through the method of LA. Patients were at the age of 22 to 72. The ratio of women and men were approximately the same (table 1).

Age	1st group		2nd group		3rd group		Total (%)
	Male	Female	Male	Female	Male	Female	
Up to 19		1	2	-	-	-	3 (1,0%)
20-44 years old	11	15	9	7	24	28	94 (31,2%)
45-59 years old	37	36	14	15	44	36	182 (60,5%)
60-74 years old	2	2	-	-	8	10	22 (7,3%)
Total Number	50	54	25	22	76	74	304

Indications to the performance of traditional adrenalectomies were considered hormonally active and non-active adrenal tumors. At that, the size of tumors reaching 1.5 centimeters, especially the ones located on the left side were subject to EDAG. After the implementation of LA, the tumors of the size from 1 to 6 centimeters, were subject to be operated this way, and the traditional way was used only in big size tumors.

The size of tumors varied from 4mm to 16 centimeters. In 188 (62.5%) of patients the growth came out from the left adrenal gland, in 111 (36.8%) – from the right one and in 2 (0.7%) patients were observed with damage of both sides of their adrenal gland. The distribution of growths depending on their size and location in analyzed groups were presented on table 2.

Sizes	1st group		2ndgroup		3rdgroup		Total (%)
	Left side	Right side	Left side	Right	Left	Right	
≤ 1 cm	5	11	42	3	2	6	69 (22,9%)
1-3 cm	22	7	2	-	26	28	85 (28,2%)
4-6 cm	18	11	-	-	42	36	107(35,5%)
7-9 cm	10	8	-	-	4	6	28 (9,3%)
10-12 cm	3	4	-	-	-	-	7 (2,3%)
≥12 cm	2	3	-	-	-	-	5 (1,7%)

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Total	60	44	44	3	74	76	301

In all analyzed patients the adrenal tumors were hormonally active. The main indicators of these growths were AH, which was observed in all of patients. In 197 (65.5%) of them was observed obesity of different level, which caused obvious technical problems in medical intervention, especially in traditional one. The duration of AH was from two months to 10 years (2.1±0.8 years on average). At the same time, the average "working" systolic arterial pressure (AP) was equal to 155±10 millimeters, when diastolic 103±3,5 millimeters. It was noted that AH in its late stages was not amenable to drug correction and were causing paroxysmal flow which made them address to specialists. Noticeably, we did not detect striking differences in duration of AH and its flowing, in the groups observed.

The growths on adrenal gland are diagnosed based on thorough clinical assessment of symptomatology, examines of blood and urine hormonal analysis, ultrasound examination and CT (pic. 1 and 2).

Picture. 1. CT of the left adrenal gland tumor

Picture. 2. CT of the right adrenal gland tumor

Medical operations in patients of the groups 1 and 3 were performed through general anesthesia with neuromuscular relaxants, but in patients of the group 2 –with local anesthesia and sedation.

Types of tumors	1st group	2ndgroup	3rdgroup	Total
Adenoma	44	29	76	149 (49,5%)
Pheochromocytoma	25	1	40	66 (21,9%)
Aldosteroma	22	2	28	52 (17,3%)
cyst	13	15	10	38 (12,6%)

Traditional medical interventions were performed in patients of the 1st group with TFL access with the length of 15 to 32 centimeters (2,4±2,5 on average). LA was performed through transabdominal access. As most of the surgeons performing LA operations, we consider that this access meets the criteria of spatial assessment of operational accesses.

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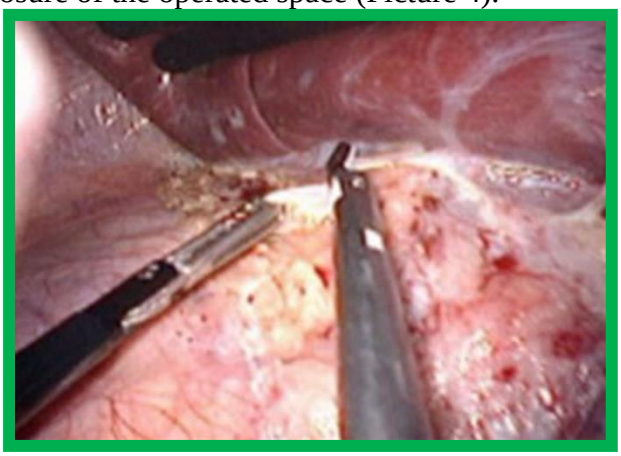
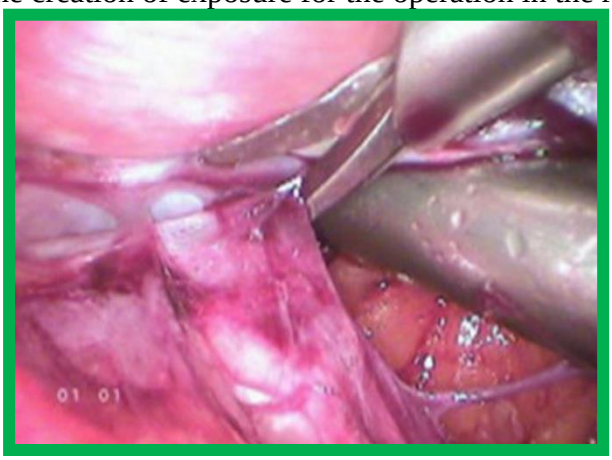
The body positioning of the patient on the operational table was on the opposite side of the affected adrenal gland. LA's were performed through 3-4 trocars (3 in the size of 10 millimeters and when necessary the fourth in size 5 millimeters). In the situations of the right side adrenalectomy the exposure of the operated space was created by cutting peritoneum on the sub-kidney area and triangular hepatic ligaments through simultaneous abstraction of liver in cephalic direction by retractor (Picture 3).

With left side adrenalectomy the exposure was created by retracting spleen in medial direction through simultaneous cutting of diaphragm-splenic and splenorenal ligament. The features of the access is that the body position of the patient on the operational table is on the opposite side of the affected adrenal gland. This is provided by gravitational displacement of organs and passive exposure of the operated space (Picture 4).



Picture 3. The creation of exposure for the operation in the right side adrenalectomy.



Picture 4. The creation of exposure for the operation in the left side adrenalectomy through with the help of side access.

The second step is accomplished by identification of the central vein of the adrenal gland, its clipping and intersecting. (Pictures 5,6).

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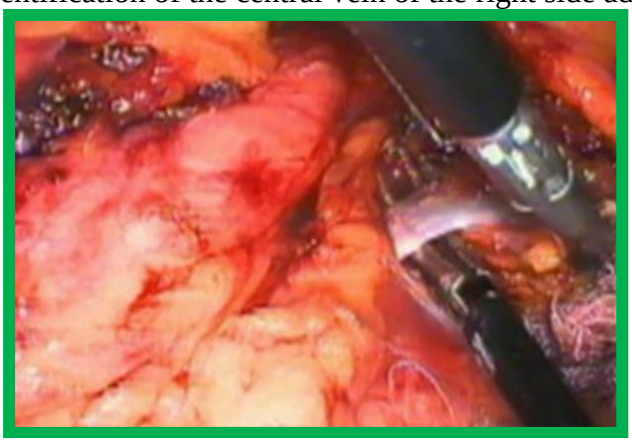
Picture 5. Identification of the central vein of the right side adrenal gland and its clipping.



Picture 6. Identification of the central vein of the left LA.

We want to point out that by using modern equipment (Harmonic) has made it available to avoid the stage of clipping with the diameter of veins up to 5 mm. Its use allowed us not to detach, clip and intersect purposefully the upper, middle and lower arteries of the adrenal gland. After intersecting the main vessels was performed the final dissection of adrenal gland and its removal. Fully mobilized gland was put into plastic container and evacuated from abdomen through hypochondrium. The operation was completed by draining the area of adrenal gland removal.

EDAG was operated with the help of local anesthesia. By femoral venous access through Seldinger with the help of specially modelled form of catheters for adrenal gland was made cannulation. Then was performed phlebography. The destruction was accomplished through the method of sharp occlusion of venous channel of the adrenal gland in combination with electrocoagulation of its central vein. For that reason, after the adrenal phlebography and assessment of gland vessels through catheter, quickly injected 5 ml of 3% solution of trombovar the central vein, after the testing phlebography and confirmation of occlusion in surface venous network of the adrenal gland together with collaterals and inner venous channel, with L-shaped radiopaque conductor, maximally wedged in to the branch of the adrenal central vein, was performed electrocoagulation of its lumen from periphery to the center. After the detection control phlebography of total occlusion of the adrenal gland venouschannel, catheter is removed. Hemostasis of femoral veins accomplished by occlusion (Picture 7).

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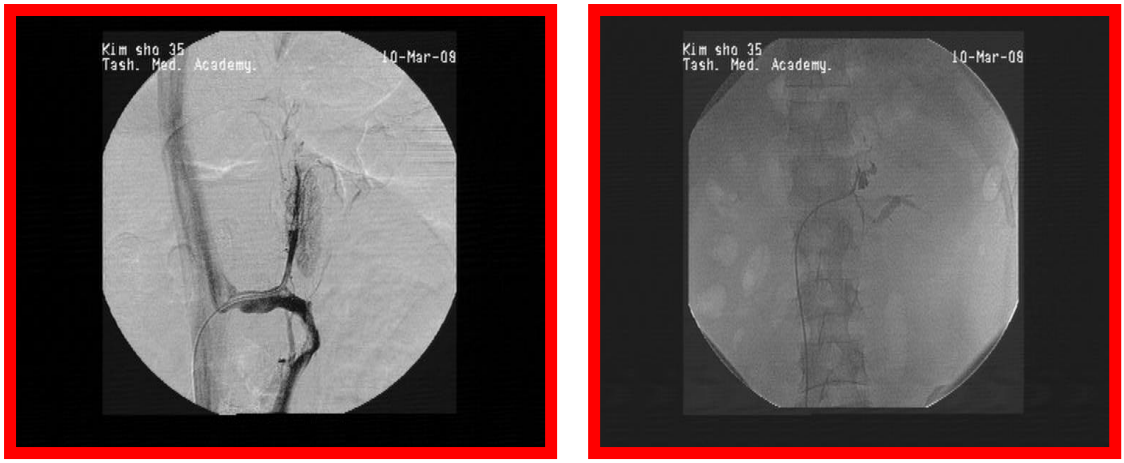

Picture 7. Acute occlusion of the venous channel of adrenal gland in combination of electrocoagulation its central vein.

Results and discussions. Analyzing the indicators of traumatic medical interventions, apparently they were highest in patients of the 1st group. Were intersected massive body of tissues opening two cavities. Patients of this group experienced expressed post operational pain syndrome, requiring narcotic analgesics, and their activity began on 2nd or 3rd days after the medical operation.

Patients of the third group had access equal in sum to 3-4 centimeters. Patients got active after only one day the medical operation. On the 2nd day the pain syndrome in this group was minimal with total absence on the 3rd day.

The most minimal aggression was noted in patients of the 2nd group. Patients were active within the limits of their beds (taking into account the existence of compressive dressing on the area of puncture). The pain syndrome on the 1st day after the medical intervention was reduced by no narcotic analgesics and was rarely observed on the 2nd day.

The duration of adrenalectomy was approximately the same. As in traditional way it was equal to 110±15,2 min. on average, in LA - 114±15,8 min. For EDGA were required approximately 65±10,5 minutes.

Intraoperative loss of blood in traditional adrenalectomy there was observed on possible complication- bleeding of inferior vena cava when doing a “complex” adrenalectomy (the bleeding is stopped by taking in the defect of the vein). During LA were observed the following complications: the damage of spleen in the first situation (we were not able to stop the bleedings by coagulation and performed laparoscopical splenectomy); parenchymatous bleeding from the right side adrenal gland in the first situation (was performed conversion and traditional adrenalectomy). It is worth to mention that these complications were detected by us on the stage of coping with the method. We haven’t detected any intraoperative complications for the last 50 LA’s. In performing EDGA from the right side was noted extravasation of contrast with continual bleeding. The patient was given a traditional adrenalectomy with seizure of bleeding. Accordingly, in patients of the 1st group were noticed complications in 16 (15.3%) cases, in 5 (4.8%) cases were noted wound abscess. In 8 situations was observed cardiopulmonary decompensation which caused a lethal outcome of one of the patients.

In patients of the second group post operational complications were seen in 2 cases: post operational pancreatitis – in one case (intraoperation due to trauma of pancreas) and in one patient detected hematoma retroperitoneal space (was observed in the early stage of our

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practice and we connect it with insufficiency homeostasis). Both of the situations were solved by conservative measures. Lethal outcomes were not noticed in this group.
In patients of the 3rd group in one of the cases was noted hematoma on the area of puncture which was resolved conservatively.
The average time of staying in the hospital of the 1st group was 13±1,8 days, in the second group - 3,1±0,8 days, in the third group - 2,2±0,6 days.
In all of the patients, who had adrenalectomy (patients of the 1st and 3rd groups) was observed regression of AP, especially in pheochromocytoma. In latest patients, adrenalectomy helped to achieve normal indicators of AP in the hospital. Later, they were not notice observed AH. In patients with aldosteroma, the reduction of AP was gradual. As, in the first 2-3 months the AP was maintained on normal indicators with the help of hypotensivepreparations. Further, the AP stabilized without the intake of medications. In patients with cystadenoma was noted reduction of AP in the early post operational period and later was changed with its increase to its initial "usual" condition. Patients continued the intake of antihypertensive drugs. At that, we consider the that the positive side of adrenalectomy in those patients is the absence of conditions with paroxysmal hypertension.
Additionally, accomplished EDGA allowed the achievement of hypotensiveeffect. They did not have paroxysmal hypertension. However, in 12 (25.5%) of those patients, during the periods from 3 to 6 months were observed repeated conditions of paroxysmal hypertension. The result observed was that the more is the size of the tumor, the less was the EDGA effect. Thus, in 2 patients with the tumor size more than 1 centimeter, the effect of hypertension remained only 3 months. In repeatedcheckup of patients with recurrence of paroxysmal hypertension on CT was detected hyperplasia adrenal gland or the existence of tumor. In 5 of those patients operated with LA lead to the achievement of normotension in 3 and the elimination of paroxysmal hypertension in 3 of the patients.
Conclusion. As has shown the comparative analysis of different methods of treating genesis of AH through medical intervention, today adrenalectomy is an operation that lets the marked reduction of AP in it, and the elimination of its paroxysmal hypertension. We consider that the preferred way of operation is the one with small invasiveness-laparoscopic.
Undeniable advantages of LA are the decrease of hospital stay as a result of its causing small amount physical injury, early recovery of working capacity, cosmetic effect. At the same, time the number of complications during and after the operation period do not exceed the ones had in traditional adrenalectomy. Nevertheless, the results mentioned are observed with tumors with the size up to 6 centimeters.
Naturally, the bigger is the size of tumor, the more technical issues are there in performing adrenalectomy. Therefore, in situations with tumors exceeding 6 centimeters, we gave our preference to traditional medical intervention. However, taking into account the advantages of adrenalectomy with its small invasiveness, in recent years we accomplished laparoscopic adrenalectomy with the technology called "hand-assist", in tumors with the size from 7 to 10 centimeters.
Considerable reduction of AP and the avoidance of its paroxysmal hypertension can also be achieved by EDGA in tumor in the size of up to 1 centimeter. In tumors of bigger size, this method is not effective. Nevertheless, despite the small invasiveness of the method, in the long-term period, in 25% of the patients the effect of reduction of AP is temporary. In our observations, from periods from 3 to 6 in those patients was seen recurrence of AH. Therefore,

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our point of view is that the EDGA is can be applied in cases with tumors up to 1 centimeter and high risk of anesthesia and surgery.

This way, LA nowadays is the preferred in most of the situations with adrenal gland tumors. Following the principles of adequate behavior of patients on all of the stages of treatment allows the reduction of risk of complications, which contributes to the safety and reliability of operations.

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