

<http://dx.doi.org/10.35630/2199-885X/2022/12/2.25>

SURGICAL OPTIONS FOR THE TREATMENT OF PATIENTS WITH CENTRAL DIABETES INSIPIDUS

Received 17 December 2021;
Received in revised form 20 February 2022;
Accepted 23 February 2022

Yulia Artemova , **Anna Plotnikova** ,
Danil Naumov , **Daria Asatryan** ,
Zinfira Kaitova , **Sergey Ryzhakin** 

General Medicine, Medical Institute. Peoples' Friendship University of Russia, Moscow, Russia

✉ asterdasha@mail.ru

ABSTRACT — AIM: to study the results of surgical treatment of central diabetes insipidus and panhypopituitarism.

MATERIALS AND METHODS: The medical records of patients operated on at the Clinical Center for Andrology and Endocrine Organ Transplantation were studied. All patients underwent allotransplantation of the pituitary gland or hypothalamic-pituitary complex on vascular connections. The maximum follow-up period of patients was 18 years.

RESULTS: In all patients in the postoperative period, positive dynamics was noted, manifested in a decrease in thirst and diuresis, an improvement in general condition with an increase in the specific gravity of urine.

CONCLUSIONS: As a result of the study, it was once again confirmed that in the absence of the effect of conservative therapy, patients with central diabetes insipidus and panhypopituitarism are recommended for transplantation of pituitary gland or hypothalamic-pituitary complex on vascular connections. In the postoperative period, all patients should be prescribed immunosuppressive therapy and local X-ray irradiation.

KEYWORDS — centeric diabetes insipidus, vasopressin, desmopressin, pituitary gland, pituitary gland transplantation, allotransplantation, hypothalamic-pituitary complex, diuresis, transplantation.

INTRODUCTION

Treatment of CDI is recommended with a synthetic vasopressin analog, desmopressin [6, 9, 2]. Sometimes natriuretic drugs (thiazide diuretics, indapamide, and others) may be used to treat central diabetes insipidus [1]. Today, desmopressin is the preferred treatment for central diabetes insipidus in the Russian Federation [7, 4]. However, surgical method has not been sufficiently studied to determine how transplantation affects performance of pituitary gland or hypothalamic-pituitary complex, as well as there are not so many medical records for rehabilitation processes and results of transplantation. It is also important

to determine how this method is going to affect key indices for treating CDI — urine specific gravity and what are pros and cons comparing to treatment with desmopressin.

Materials and methods of research

The medical records of patients who underwent surgery at the Clinical Center for Andrology and Endocrine Organ Transplantation were studied. A total of 14 people, including 7 women and 7 men. The average age was 20–35 years. All patients underwent pituitary or hypothalamic-pituitary complex allografts on vascular connections. The maximum follow-up period is 18 years.

RESULTS AND DISCUSSION

The median age of the patients was 20–35 years. All patients with this disease complained of general weakness, dry skin. During the day, they used to drink 12–25 liters of liquid with the need to urinate up to 25–27 times a day. The specific gravity of urine was 1001–1005. All patients underwent allograft of pituitary or hypothalamic-pituitary complex on vascular connections. The operation of transplantation of the pituitary gland or hypothalamic-pituitary complex on the arteriovenous pedicle (in Russia, this method is named after its developer, I. D. Kirpatovsky) consists of 3 stages: 1) pituitary graft collection from a donor, 2) preparation of the graft and its vascular pedicle for transplantation and 3) transplantation of the pituitary gland [8]. The transplant is taken from young people who have died from causes unrelated to craniocerebral pathology. In addition to the pituitary gland and its funnel, the graft includes cavernous sinuses with dura mater, the intersection of the optic nerves, as well as segments of the right and left internal carotid arteries with the anterior and middle arteries of the brain. In order not to dislocate the numerous vascular anastomoses of the upper and lower pituitary arteries while getting the graft, the pituitary body is taken from a corpse with the bones of a Turkish saddle. During the preparation of the graft for transplantation, bone fragments are removed. The graft is transplanted either to the hip with connection to the deep artery of thigh and the great saphenous vein, or to the anterior abdominal wall in the area of lower epigastric veins. When choosing a transplant placement, on the hip

or anterior abdominal wall, doctors are guided by the recipient's age and his constitutional features. With a normal physique and well-developed vessels, the graft was connected to the lower epigastric vessels. For patients with insufficient development of blood vessels, as well as for children, the graft was connected to the deep femoral artery. A dissection is made on the anteromedial surface of the thigh and the fascial bed of the adductors is opened, when graft is transplanted to a deep femoral artery. For venous outflow in this case, it is favorable to use a great saphenous vein.

In the postoperative period, all patients received immunosuppressive therapy, including prednisone, chorionic gonadotropin, heparin, and local X-Ray radiation exposure. All patients underwent immunological monitoring. Three patients developed a rejection crisis in the postoperative period. Two of them occurred in the first week after surgery and was successfully stopped by amplifying immunosuppressive therapy and additional local X-ray irradiation of the graft area. The graft function was not impaired after X-ray irradiation.

We recorded improvements for all patients in the postoperative period, which resulted in a decrease in thirst and urine output, an improvement in general condition with an increase in the urine specific gravity. With a smooth flow of the postoperative period, after 2-3 weeks, the amount of liquid consumed decreased to 4–6 liters, the urinary frequency decreased to 9–10 times a day.

By the time of discharge and in the long-term period, patients consumed 2–3.5 liters of liquid per day with a frequency of urination 6–7 times a day. The specific gravity of urine in the immediate postoperative period (before discharge from the hospital) increased to 1008-1010, and in a more distant period – to 1010–1020.

During the first year of follow-up, 11 out of 12 patients showed persistent normalization of diuresis (up to 2–4 liters per day with complete cancellation of hormone replacement therapy). Only 1 patient developed an irreversible rejection episode that led to a relapse of diabetes insipidus, which required the reinitiation of hormone therapy at the same dose as before the operation. 8 patients were examined and 7 of them retained normal diuresis in observation period from 1 to 5 years. 6 patients were observed for period from 6 to 10 years. Completely normal diuresis was recorded for 2 patients, while 4 patients took small doses of hormonal drugs to normalize diuresis. The maximum follow-up period after allotransplantation was 18 years (Table 1).

In the long-term observation period from 11 to 18 years after allotransplantation, 3 patients were ex-

amined. It was recorded that 2 of them took hormone preparations in a lower dose than before the operation, whereas 1 patient had to take hormones in full volume [3]. After 8 years of normal functioning of the hypothalamic-pituitary graft after suffering severe influenza virus infection, 1 patient had a relapse of diabetes insipidus without signs of its rejection, apparently due to viral damage to the nuclei in the hypothalamus of the transplanted complex. After additional evaluation, this patient underwent a successful repeated heterotopic transplantation of the hypothalamic-pituitary complex with the complete disappearance of the symptoms of central diabetes insipidus. The repeated graft has been functioning in accordance with standards for more than 2 years [3].

CONCLUSIONS

1. As a result of the study, it was once again confirmed, that in the absence of an effect from conservative therapy in patients with central diabetes insipidus and panhypopituitarism surgery is recommended. Specifically, these are transplantation of the pituitary or hypothalamic-pituitary complex on vascular connections due to its efficiency.

2. After allotransplantation, all patients should be prescribed immunosuppressive therapy, including prednisone, chorionic gonadotropin, heparin, as well as local X-ray radiation.

3. A one-year follow-up after allotransplantation is necessary for normalization of diuresis.

REFERENCES

1. **AL NOFAL A.** THIAZIDE Diuretics in the Management of Young Children with Central Diabetes Insipidus. *The Journal of Pediatrics*. Lteif A, 2015.167(3):658-661. DOI: 10.1016/j.jpeds.2015.06.002
2. **CHANSON P., SALENAV S.** Treatment of neurogenic diabetes insipidus. *Ann, Endocrinol Paris*. 2011, 72(6):496-499. 10.1016/j.ando.2011.09.001
3. **KHARCHENKO M. A., LICHENKO A.G., KAITOVA Z.S.** Female transsexualism - the problem of gender identification. *Zdorov'e i obrazovanie v XXI veke – Health and education in the XXI century*. Moscow, 2016, pp. 70-71.
4. **KIRPATOVSKY I.D., KIRPATOVSKY V. I.** Neuroendocrine transplantation. 2018, p.86.
5. **MAZERKINA N. A.** The drug vasomyrin in the treatment of central diabetes insipidus in children. *Farmateka - Pharmateca*. 2014, pp. 86-90.
6. **PIGAROVA E.A.** Central diabetes insipidus: pathogenetic and prognostic aspects, differential diagnosis. *Dissertation for the degree of Candidate of Medical Sciences*. Moscow. 2009, p.203.

Table 1. Long-term results of allotransplantation of the hypothalamic-pituitary complex in a patient with diabetes insipidus and panhypopituitarism

Terms of observation	Number of observations	Hormone therapy			Without a rejection crisis	Relief crisis	The crisis is not stopped
		Canceled	Dosage reduced price	The dose is not reduced			
Up to 1 year	12	11	0	1	10	1	1
1–5 years old	8	7	1	0	8	0	0
6–10 years old	6	2	4	0	6	0	0
11–18 years old	3	0	2	1	3	0	0

7. **PIGAROVA E. A., MIKHAILOVA D. S., DZERANOVA L.K., ROZHINSKAYA L. YA. AND OTHERS.** Central diabetes insipidus in the outcome of transsphenoidal treatment of tumors of the hypothalamic-pituitary region. Treatment and prevention. 2014, pp.14-40.
8. **SAIFAN S., NASR R., MEHTA S. ET AL.** Diabetes insipidus: A complex diagnosis using new medical treatment methods. Nephrology ISRN. 2013: 1-7.
9. **VANDE WALLE J., STOCKNER M, RAES A, NORGAARD J.** Desmopressin 30 Years in Clinical Use: A Safety Review. Current Drug Safety. 2007, 2(3):232-238. DOI: 10.2174/157488607781668891