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Adolescent Varicocele; Is Varicocelectomy Necessary?

HATSUKI HIBI[1)2)], MIHO SUGIE[1)] and YOSHIMASA ASADA[2)3)]

[1)] *Department of Urology, Kyoritsu General Hospital, 4-33 Goban-cho, Atsuta-ward, Nagoya, 456-8611, Japan*
[2)] *Asada Ladies Clinic, Nagoya Building 4F, 4-6-17 Meieki, Nakamura-ward, Nagoya, 450-0002, Japan*
[3)] *Asada Institute for Reproductive Medicine, Nagoya Building 5F, 4-6-17 Meieki, Nakamura-ward, Nagoya, 450-0002, Japan*

Introduction: We have retrospectively evaluated whether varicocelectomy contributes to improved testicular growth and semen findings in puberty at our institute during the last decade.

Methods: From June 2008 to June 2017, fifty cases of adolescent varicocele that had been diagnosed and followed up for more than 5 years at our male infertility division. Of these, the testicular growth and semen findings were compared between with receiving varicocelectomy group and without group.

Results: The location of the varicoceles were left-sided (47) and bilateral (3). Grade 3 varicocele was observed in 42 cases, whereas grade 2 in 5. In bilateral cases, two had grade 2 in the right and grade 3 in the left, and bilaterally grade 3 in one. The 20 cases (40%) underwent microscopic varicocelectomy with preservation of lymphatic vessels. One case of contralateral orchiectomy and another case of contralateral mumps orchitis did not accept surgery despite poor semen quality. On the other hand, thirty patients (60%) did not undergo surgery. Eighteen cases (90%) who received varicocelectomy achieved "catch-up growth" of the testis at median two years follow-up. Whereas in the 30 cases without surgery, twenty-three cases (76.7%) showed testicular catch-up growth during the observation interval, and 7 cases demonstrated a reduction of the varicocele grade with physical growth. Due to the small number of semen samples obtained in this study, the effect on semen quality remained unknown.

Conclusion: We could not predict whether varicocelectomy would prevent future deterioration of testicular growth and semen findings in adolescent varicocele.

Key words: adolescent varicocele, varicocelectomy, testicular catch-up growth, semen analysis

INTRODUCTION

Due to increased public awareness of infertility, the number of cases diagnosed as adolescent varicocele has increased along with parental concerns. The prevalence of varicocele is as high as 15% in children and adolescents. Although varicocele is a common condition during puberty, varicocele may induce male infertility. However, there is debate about whether adolescent varicocele should be treated with varicocelectomy in order to improve testicular growth and semen findings or whether it should just be followed-up[1)2)3)4)]. Optimal management of varicocele has not been consolidated. We retrospectively evaluated adolescent varicocele at our institute during the last decade.

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Correspondence to; Hatsuki Hibi, M.D. Department of Urology, Kyoritsu General Hospital, Tel: +81-52-654-2211, Fax: +81-52-651-7210, E-mail: hibih@quartz.ocn.ne.jp ORCID ID: 0000-0001-9579-7064

MATERIALS AND METHODS

1525 cases visited our male infertility division from June 2008 to June 2017. Sixty-five cases (4.3%) were diagnosed with adolescent varicocele during the above 10-year period. The median number of visits over the 5-year period was 4 (2-9). Since 15 cases dropped out after only the first visit, they were excluded from this analysis. Fifty cases (3.3%) were followed up for five years and included in this review.

One case had a history of contralateral mumps orchitis, another had contralateral orchiectomy due to trauma. One case having varicocele recurrence after surgical high ligation technique showed scrotal pain after surgery. Testicular size was judged by using a punched-out orchidometer. Varicocele grade was judged by palpation at rest with the aid of Valsalva maneuver[5]. Semen analysis was proposed when the cases reached high school age. Collected sperm were counted using a counting chamber under microscope.

Twenty cases (40%) underwent varicocelectomy with preservation of lymphatic vessels under operative microscope procedure (varicocelectomy group). Thirty cases did not undergo surgery (observation group), but underwent periodic check-ups of testicular growth and also semen analysis when possible. These periodic examinations were basically conducted once yearly unless there were any symptoms. We considered that indications for varicocelectomy were those with obvious poor testicular growth on varicocele side during follow-up and those with poor semen findings. While one case desired to receive surgery due to cosmetic reasons, one case of contralateral orchiectomy and another case of contralateral mumps orchitis did not accept surgery despite poor semen quality.

We evaluated the changes in testicular growth and semen findings in varicocelectomy and without surgery cases. Testicular growth was judged by whether "testicular catch-up growth" was obtained. We used the definition of the "testicular catch-up growth" previously described by Gershbein et al[6]. that results in an increase in testicular volume of at least 15%, and greater than 85% of the contralateral volume.

RESULTS

Median age was 16 (12-24) years in varicocelectomy group, and 13 (10-18) years in observation group. Testicular volume was right-14 (2-26) mL and left-12 (2-26) mL in varicocelectomy group, and right-13 (4-26) and left-10 (4-26) in observation group. The location of the varicocele was left-sided in 18 cases and bilateral in 2 in the varicocelectomy group, whereas was left-sided in 29 cases and bilateral in 1 in the observation group. Grade of varicocele among left-sided cases, grade 3 in 42 cases, and grade 2 in five. Grade of bilateral varicocele; grade 2 right side and grade 3 on left side in two cases, and bilaterally grade 3 in one. Patient characteristics were shown as Table 1.

In the varicocelectomy group, the location of the varicocele was left-sided in 18 cases and bilateral in 2. 19 cases underwent a high ligation technique, whereas one case of varicocele recurrence after high ligation underwent low ligation technique. Median surgical duration was 78.5 minutes (55-139). Mean preserved lymphatic vessels was 3 (1-5), details are as follows; one vessel in 3, two vessels in 3, three vessels in 10 (included two bilateral cases), four vessels in 3, and five vessels in 2 (included one bilateral case), respectively. No scrotal lymphatic edema was observed postoperatively. All cases showed subsided venous dilatation of

Table 1. Patient characteristics

	Varicocelectomy group (n=20)	Observation group (n=30)
Age*	16 (12-24)	13 (10-18)
Testicular size (right/left, mL)*	16 (2-24)/13 (2-22)	13 (4-26)/10 (4-26)
Varicocele site	Left sided=18/bilateral=2	Left sided=29/bilateral=1
Grade (left sided, n=47)	grade 3=17/grade 2=1	grade 3=27/grade 2=2
Grade (bilateral, n=3)	grade 2 (right)/grade 3 (left)=1, bilaterally grade 3=1	grade 2 (right)/grade 3 (left)=1
BMI (kg/m^2)*	19.9 (15.4-22.3)	18.6 (15.8-22.0)

BMI: body mass index
*Data are shown as median (minimal−maximum).

scrotum. One case having varicocele recurrence had reduced scrotal pain after low ligation.

Eighteen cases (90%) who showed poor testicular growth achieved "catch-up growth" at median two years follow-up after varicocelectomy. On the other hand, of the 30 observation cases twenty-three (76.7%) showed testicular catch-up growth during the observation interval. Furthermore, 7 cases (23.3%) had reduced the varicocele grade (grade 3 to grade 1 in two cases and grade 3 to grade 2 in two) with physical growth. The results of the testis volume measurements are shown in Table 2.

Semen analysis was available in only 4 cases of each group at start of follow-up. Mean sperm concentration and motility were 10 (5-20)$\times 10^6$/mL and 55 (46-85)% in varicocelectomy group, and 21.5 (3-40)$\times 10^6$/mL and 65 (24-80)% in observation group, respectively. After varicocelectomy and observation, semen analysis was available in only 3 cases of varicocelectomy and in 7 cases of observation group. The semen findings were unchanged in each group during follow-up period. The results of semen analysis are shown in Table 3.

DISCUSSION

Most varicoceles are diagnosed during investigation for male infertility, whereas in cases of pediatric and adolescent varicocele it is com-

Table 2. Testis volume of varicocelectomy and observation group

	Varicocelectomy group (n=20)		Observation group (n=30)	
	Initial visit	Follow-up	Initial visit	Follow-up
Right testis (mL)	16 (6-22)	16 (14-22)	10 (2-26)	18 (8-22)
Left testis (mL)	12 (4-22)	16 (10-22)	9 (2-26)	14 (6-24)

Data are shown as median (minimal−maximum).

Table 3. Semen analysis of varicocelectomy and observation group

	Varicocelectomy group (n=20)		Observation group (n=30)	
	Initial visit (n=4)	Follow-up (n=3)	Initial visit (n=4)	Follow-up (n=7)
Sperm concentration	10×10^6/mL (6-22)	16×10^6/mL (4-17)	21.5×10^6/mL (3-40)	21×10^6/mL (3-118)
Sperm motility (%)	55 (46-85)	36 (33-52)	65 (24-80)	54 (34-88)

Data are shown as median (minimal−maximum).

monly diagnosed as an asymptomatic unilateral scrotal swelling due to venous dilatations. Along to increased public awareness of infertility, the number of cases diagnosed as adolescent varicocele has increased along with parental concerns. The purpose of adolescent treatment is in achievement of testicular growth and to reduce the risk testicular injury, which may be achieved by varicocelectomy. Adolescent varicocele candidates for varicocelectomy are unilateral or bilateral case with testicular poor growth according to the guidelines of American Society for Reproductive Medicine (ASRM)[7], American Urological Association (AUA)[8], and European Association of Urology (EAU)[9]. Lipschultz and Corriere reported that the presence of varicocele was associated with poor testicular growth and suggested that early surgery might halt this process[10]. Heinz et al. reported that testicular histology was already abnormal on 12-year-old boys and more severe abnormalities were seen in older adolescent[11]. Pozza et al. also found that a 74% incidence of testicular atrophy and a 90% incidence of abnormal histology[12]. Thus, histological changes may have already occurred during early pubertal development and appear to progress over time.

Based on two separate meta-analysis, Nork et al. concluded that the presence of varicocele in young people appears to adversely affect sperm quality[13]. The presence of varicocele in adolescents appears to adversely affect sperm concentration, motility and morphology. Treatment appears to modestly improve sperm concentration and sperm motility[13]. In addition, a large single-center study found that microsurgical varicocelectomy in adolescents with varicocele can significantly increase live birth rates and reduce time to conception after surgery. Cases who underwent varicocelectomy had improved sperm parameters and were 3.63 times more likely to become fathers than controls who did not undergo varicocelectomy[14].

On the other hand, there is no conclusive evidence that a varicocelectomy improves the spontaneous pregnancy rate and semen parameters[15]. Bogaert et al. reported on adolescent boys aged 12-17 years who had varicocele and were treated with minimally invasive techniques such as sclerotherapy or conservative follow-up to determine whether they could father a child[16]. Paternity was achieved in 85% of the conservative follow-up group and 78% of the active treatment group ($p > 0.05$).

Overtreatment and under treatment are costly, both medically and financially. Koron conducted a systematic literature review and concluded that testicular atrophy resolves after varicocelectomy but may resolve spontaneously with follow-up into puberty[17]. In the present study also, 7 of 30 cases (23.3%) obtained an improvement in grade of varicocele during follow-up period. Not all adolescents with a varicocele experience testicular underdevelopment or subfertility, so active surveillance may be a useful strategy[18]. Based on randomized controlled trials, there is a low to moderate evidence that radiological or surgical treatment of adolescent varicocele is associated with improved testicular growth and sperm concentration. However, the ultimate effects on fertility and birth rates are unknown[19].

In this study, testicular catch-up growth was achieved in 90% of the varicocelectomy group, whereas in 76.7% of the observation group. Semen analyses were available in only 15% of the varicocelectomy group and 23.3% of the observation group. The main reason may be that future infertility problems are not considered during adolescence. The low number of cases observed here that underwent semen

analysis is a major difference between the adolescent varicocele and the infertile male varicocele. We were unable to determine whether surgery contributed to testicular growth and improved semen findings. However, it is unclear if not having varicocelectomy would really affect future infertility. Despite the lack of consensus in the current literature regarding the usefulness of treating varicocele, in light of these data the possibility that the affected testicle can benefit in terms of testicular growth and function must certainly be taken into consideration. Varicocelectomy alone in well-studied and fully treated pediatric cases does not wholly preserve their fertility potential[20]. Periodic check-up of testicular growth and semen quality are necessary, optimal follow-up duration is case dependable. We should decide on an individual basis how many years of follow-up is needed, adolescent cases may hesitate to visit a hospital because of a lack of emotional support or because infertility is unrealistic issue. Even after follow-up is completed, the case should be counselled and understand that semen findings are important if fertility is desired.

Limitations, reasons for caution

The present study was retrospective and sample size was small.

Wider implications of the findings

Whether the varicocelectomy can prevent future deterioration of semen findings in an adolescent is unpredictable. Regular check-ups including semen analysis and follow-up are mandatory.

CONCLUSIONS

We could not predict whether varicocelectomy could prevent future deterioration of testicular growth and semen findings in adolescent varicocele.

Disclosures

This study was conducted in accordance with the Declaration of Helsinki and Good Clinical Practice guidelines, and written informed consent was obtained from all participants.

This paper was presented at the 110th annual meeting of the Japanese Urological association held at Kobe in April 2023.

Ethical approval

The protocol for this research project, including its use of human subjects, was approved by a suitably constituted Ethics Committee. (Our approval number: 2022-04, Date of approval by the Ethical Review Committee: 2022/08/29)

Conflict of interest

Each author has no COI with regard to this manuscript.

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