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Incidence of Testicular Atrophy Post-Orchidopexy at Sultan Qaboos University Hospital, Oman

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Abstract

Background: Orchidopexy is the surgical intervention of choice for the correction of congenital undescended testes. This study carried out to determine the incidence of testicular atrophy among patients who underwent orchidopexy in Sultan Qaboos University Hospital from November 2016 to October 2018. Secondary objective was to determine factors leading to development of atrophy post-orchidopexy.

Methods: A prospective longitudinal cohort study conducted from November 2016 to October 2018 at Sultan Qaboos University Hospital (SQUH). Checklist containing information about the pre-operative examination and perioperative factors that could lead to atrophy was filled. Patients were followed-up in the outpatient department during a period of one month to twelve months. Testicular atrophy was defined as more than 50% loss of testicular volume or a postoperative testicular volume less than 25% determined by physical examination.

Results: There were 73 patients included in the data analysis after 14 lost follow-ups. The number of patients with atrophy was 26 (36.0%) compared to 47 (64.0%) with no atrophy. The study showed that development of atrophy occurred within a mean age of 19.62 months compared to a mean age 32.43 months for the normal testis group (p=0.026).

Conclusion: This study has reported a testicular atrophy incidence of 36%. The percentage is higher than what is mentioned in the literature which ranged from 1.83% to 28.1%. The age of patients on operation day represents an inverse relationship with the incidence of developing atrophy. The results thus encourage further research in a better designed study to identify the atrophy rate with a more objective measurement, and to identify possible causes leading to post-orchidopexy testicular atrophy in our center.

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Background

Orchidopexy is the surgical intervention of choice for the correction of congenital undescended testes [1,2]. Non-surgical hormonal treatments for cryptorchidism have also been offered over the years, however it has eventually lost popularity due to the unsatisfying outcomes and the long-term side effects on spermatogenesis [3]. The exact timing to perform the operation remains debatable, however most studies prefer early orchidopexy as an attempt to preserve fertility, improve testicular growth and decrease the risk of testicular cancer [1,4].

The literature has supported this preference revealing that histological examination of undescended testes at the age of twelve to eighteen months of age showed evidence of significant loss of Leydig cells and germ cells. Adding to that, studies have suggested that early orchidopexy gives the chance of testicular "catch up" growth [5,6].

The current age recommendation to perform orchidopexy is six to twelve months of age or, as stated in some articles, not more than eighteen months of age. Compared to the 1950s where the age recommended for orchidopexy was ten to fifteen years, then to five or six years in the 1970s and finally one to two years in the 1990s. The trend has been going down, in regard to age, to perform orchidopexy [7-9]. Orchidopexy is a common surgical procedure done, in Sultan Qaboos University hospital, by the pediatrics surgery department. There is lack of data, of any kind, from the Omani population. The rationale was to conduct this study to gather preliminary data for the Omani population and then assess the outcome according to the published data regarding the procedure.

Methods

The needed data was collected in the context of the chosen study design. This study was a prospective longitudinal study that took place in Sultan Qaboos University Hospital. The primary objective was to assess the incidence of testicular atrophy post-orchidopexy in our center. The secondary objective was to assess and identify factors that could cause atrophy to the testis. There are multiple factors that are thought to influence the outcomes of this surgical procedure causing atrophy of the testis. After reviewing the literature for possible factors that can lead to atrophy post orchidopexy. A checklist was created that emphasized these factors to be accounted in this study. Informed consent from the caregiver of the child undergoing the surgery was obtained to be enrolled in this study. The operating surgeons were asked to fill the checklist directly after the operation in the OT room. The patients with complete information were included to the study. Their data was inserted into an EpiData sheet on a computer device that was secured in the hospital. The initial study design was to follow up the patients in the outpatient department at one, three, six, and twelve months. Inclusion criteria involved patients undergoing orchidopexy, normal sized testis before the procedure and testes that could be found intra-op and brought down to the scrotum. Exclusion criteria was, any patient with any sort of genital abnormalities, patients with prior treatment with GnRh, those with no testis found intra-op, atrophic testis prior to surgery, Incomplete checklists and Loss of follow up in the outpatient clinic. No laboratory or radiological investigations were required to include patient in the study. During the period of follow up, testicular atrophy was identified based on clinical examination only by palpating the size of the affected testis. In which loss of 50% of the testicular volume or postoperative testicular volume less than 25% of the contralateral testis was considered atrophic. All data was analyzed using the 23rd version of IBM SPSS.

Results

There were 87 patients initially identified in the study based on a complete checklist. Those patients have undergone orchidopexy from November 2016 to October 2018 at Sultan Qaboos University Hospital (SQUH). Out of the 87 patients, 73 were included in the data analysis as 14 patients were lost to follow-up in the outpatient clinic. As shown in Figure 1, 26 out of the 73 patients were found to have testicular atrophy, making the incidence of testicular atrophy (36.0%) while (64.0%) did not develop atrophy. The study also showed that there was a significant relationship between the age at the timing of operation and development of testicular atrophy. As represented in Table 1, patients who developed testicular atrophy in our study have undergone orchidopexy at a mean age of 19.62 months compared to a mean age of 32.43 months for those who didn't (p=0.026).

When comparing the birth weight of patients who developed atrophy post orchidopexy to those who didn't, there was no statistical significance found (p=0.998). Those with atrophy had a mean birth weight of 2896.30 grams while the normal testis group had a mean birth weight of 2895.81 gr. The procedure of choice to perform orchidopexy couldn't be assessed as a factor to develop atrophy in our study as only 8 patients underwent laparoscopic repair with Fowler Stephen procedure compared to 65 patients who underwent open repair. Only one patient in the laparoscopic group developed atrophy. Table 2 shows the procedure used and the number of patients in each procedure. It also compares the number of patients who developed atrophy in each group.

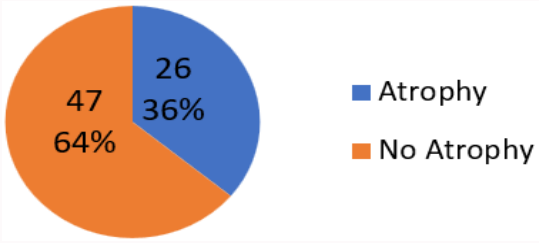

Figure 1: Percentage of post-orchidopexy testicular atrophy among patients undergoing orchidopexy in SQUH from January 2016 to October 2018.

Table 1: Mean age of operation among patients who developed atrophy post orchidopexy in SQUH from 1st January 2016 to 31st October 2018.

	Mean	Number	Atrophy	P-value (Sig 2-tailed)	Pearson correlation
Age at operation in months	32.43	47	No	0.026	-0.26
	19.62	26	Yes		

Table 2: Procedure of choice among the 73 patients included in our study who underwent Orchidopexy in SQUH from January 2016 to October 2018.

Variables		Atrophy		Total
		No	Yes	
Procedure of Choice	Open	40	25	65
	% within atrophy		96.20%	89%
	Laparoscopic	7	1	8
	% within atrophy		3.80%	11%
Total		47	26	73

Discussion

Like all surgeries, orchidopexy carries a number of complications in which the most recognized is testicular atrophy [10]. One of the mechanisms thought to play a role in the atrophic process is the iatrogenic trauma during surgery like torsion, injury to the spermatic vessels and tension on the cord with subsequent ischemia [11-13]. As an end result, this leads to germ cell loss and impaired germ cell maturation [14]. In the light of that knowledge, our study closely highlighted these risk factors in all patients included. In addition to intra-operative traumatic events, Radmayr identified the age of the patient on the surgery date as a major contributor to fertility outcomes [11]. The European Association of Urology/European Society for Pediatric Urology Guidelines suggests that orchidopexy should be offered before the age of 12 months, and by 18 months at the latest [11]. These guidelines were published based on the literature evidence that supports the concept of early orchidopexy improving fertility and sperm production. A study done by Daniel et al. in the year 2000, aimed to evaluate the fertility outcomes of patients with bilateral cryptorchidism who underwent early orchidopexy. During this study 15 patients were successfully followed up for two decades and the number of spermatogonia was the parameter of choice to assess fertility. Upon analyzing the results, the number of spermatogonia correlated inversely with the age of the surgery (P=0.021) [15]. Another retrospective study by Coughlin et al. assessed male fertility in patients post-orchidopexy from a hormonal perspective. In which inhibin B and Follicle-Stimulating Hormone (FSH) were measured in a total of 84 men with a history of bilateral cryptorchidism who underwent orchidopexy. This study also concluded that men who underwent orchiopexy by the age of two years have a higher inhibin B and lower FSH profiles than those who underwent surgery later in

life. Which is a finding suggestive of the beneficial effect on fertility in early orchiopexy [16]. Whether fertility was determined by number of spermatogonia or hormone levels, most of the international studies show that early surgical intervention provides higher chances of preserved fertility [17,18]. Contrary to these findings, in our study, the rate of testicular atrophy was higher in patients operated on at a younger age. Those found to have atrophic testis were patients who underwent the surgery at a mean age of 19.2 months, while patients included in the normal testis group were those who underwent the surgery at mean age of 32.43 months. This gives the picture of an inverse relationship between the age of surgery and the incidence of developing testicular atrophy. Atrophy and/or loss of testicular volume is seen as an effective variable to determine testicular function and predict semen profile, as up to 90% of the testis is composed of seminiferous ducts [19].

The accuracy of our results may be debated however, as it is influenced by the method of assessing testicular volume. As mentioned earlier, the assessment of testicular atrophy during follow up was based solely on the clinical examination which is not an objective method to getting accurate results. Moreover, even though a 50% decrease in the size of the testes may represent atrophy [20]. The other parameter which is the postoperative testicular volume less than 25% of the volume of the contralateral testis may be misleading, especially in cases of unilateral undescended testis. A study done by Tseng et al. showed that the relative size of the undescended testis remained smaller than the contralateral normally descended testicle, both preoperatively and postoperatively [1]. Despite the improvement in the ratio of undescended testis to normal descended testis post-orchidopexy, the volume of the affected testes in this study remained significantly smaller [1]. The discussion in the literature at its essence, acknowledges that testicular volume is a trusted and a practical parameter to assess future testicular function. However, measuring the testicular volume needs to be more objective using assessment tools, such as ultrasonography or orchidometers. Both preoperative and postoperative at an adequate follow up period. In relation to the dominant literature in the theme of testicular atrophy post-orchidopexy, there is another difference worth mentioning in the results of our data analysis. This difference is seen in the relatively higher calculated incidence of atrophy in patients involved in the study. Some studies have reported a general atrophy rate of an average of 5% [20,21], a systematic review done on 2013 revealed more conditional results, showing an overall atrophy rate of 1.83% for primary orchidopexy, 8.2% for the two-stage approach and a rate up to 28.1% for one-stage Fowler Stephens procedure [22]. The percentage of testicular atrophy post orchidopexy in our study was 36%, as 26 out of 87 patients were found to have developed atrophy. These outcomes are roughly 8% higher than the upper limits of testicular atrophy percentages reported in the literature. The results may be explained by the subjective methods used to assess testicular atrophy. It can also be explained by the fact that there are many patients who were not accounted for in our data, as not all patients, who got operated at that period for orchidopexy, had the checklist filled. Other causative factors to the significantly higher incidence may be related to the expertise, as junior members of the surgical team usually perform the operation, this increases the risk of traumatic events and intra-operative complications. However, evidence on the incidence of atrophy related to the grade of the surgeon remains contradictive, as a large number of studies has proven a significant correlation while other studies failed to find a valid association [19,20]. Another point that may have influenced the results is the incompliance to the follow up pattern suggested by this study, that was supposed to be at one, three, six and twelve months. During every visit, the volume was to be assessed and documented. Unfortunately, there was a lack of compliance to give the patients the intended follow up appointments by the team. Consequently, results of patients included were based on those who were followed up during all or either of these durations. This may have led to a false increase in the atrophic numbers, especially in those who have only been assessed during the early months post-op where no testicular "catch up" growth have occurred yet. However, there is a prospective study by Durell et al. which had a similar study design to assess testicular atrophy, but despite the similar settings of that study to ours, the results of the reviewed study agreed with most of the current publications and stated that only 2.6% of patients have developed atrophy [20].

Limitations

Limitations discussed in this section are very important to acknowledge when attempting to compare the results of this study to the current literature. The number of patients involved in this study did not reflect the total number of patients who underwent orchidopexy in the Sultan Qaboos University Hospital within the given period of time. This was primarily because not all cases were documented within the checklist, in addition to that, some checklists lacked major information and had to be excluded from the study. Unfortunately, as the study progressed to the next step, the number has further decreased due to loss of follow up. Another important limitation to highlight is the subjective method of assessing testicular volume both preoperatively and postoperatively, which depended entirely on palpation. Moreover, the fact that patients included in our study have been examined by different doctors increased the change of error as different doctors may personally perceive testicular volume loss differently. The element of bias is valid to tackle as a possible limitation in assessing factors that could lead to atrophy. As all the other factors that were in the checklist but not mentioned in the results section couldn't be assessed as all the factors that could lead to atrophy were denied. This marks the obvious bias as the operating surgeons know the possibility of developing atrophy if any of the mentioned factors in the checklist were present. This is because the same surgeon who has performed the surgery was assigned to fill the checklist that involved documenting intraoperative complications, and occasionally the same operating surgeons would evaluate the presence of testicular atrophy in the OPD follow up sessions.

Finally, failing of compliance by the surgical team to the suggested follow up scheme of the patients in the outpatient clinic was a significant limitation that has changed the intended structure of this study. This has resulted to unfixed assessment visit timings which extended from one month to twelve months post-op.

Conclusion

The study had multiple limitations affecting the results as mentioned above. However, the results of this research have introduced a stimulating angle on the management and follow up of patients with cryptorchidism in general and within our institute. The inability to get results close to those mentioned in the literature encourages the conduction of another study with a similar aim in our institute in the near future. It is necessary, as it gives us the chance to reevaluate the outcomes after deterring the limitations faced in this study. It will also shed a light if the literature range of atrophy post-

orchidopexy is to be revised by future studies by different centers internationally.

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