ORIGINAL PAPER

The distribution of the clinical variables in a population of adult males circumcised for phimosis: A contribution to the clinical classification of phimosis

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__Summary__ *Background: The literature regarding the quality of the sex life in adult males after circumcision, due to phimosis, is scarce and sometimes contrasting. This could be due to comparisons of a nonhomogeneous distribution of the clinical variables of men who have undergone circumcision.*
Objective: The objective of this study was to evaluate the distribution of the clinical variables in the adult male population who had circumcision for phimosis, and to propose a clinical classification of the phimosis to characterize it in adult males in more homogeneous sub-groups for the common clinical variables.
Materials: A population of 244 adult male patients with phimosis was evaluated retrospectively. The mean age was 50.7 years. Each patient was classified according to the most common clinical variables. The variables that make up this classification of the phimosis were: Position (P1-2) to indicate if phimosis is present when the penis is at rest (P2) or only during an erection (P1); Grade (G 0-4) in relation to the extent of glans visibility; Complexity (Co 0-4) of comorbidities; Timespan (T 1-10) of the phimosis.
Results: The distribution of the variables was the following: Position P1:30.73%, P2:69.26%; Grade G0:30.73%, G1:23.77%, G2:27.45%, G3:12.29%, G4:5.73%; Complexity (associated penile comorbidities): C0:48.36%, C1:4.5%, C2:0.8%, C3:43.03%, C4:3.27% Timespan: 57.78% of the patients had phimosis for less than a year; 18.03% between 1 and 2 years; 11.88% between 2 and 10 years; and 12.29% for more than 10 years.
Conclusions: The distribution of the clinical variables in the adult male population who underwent circumcision due to phimosis was not homogeneous regarding the appearance, severity, comorbidity, and timespan. This non-homogeneity could explain, in some cases, the contrasting results regarding the quality of sex life after circumcision in the literature. The proposed classification can offer an objective tool for researchers and clinicians group the patients into more homogeneous subgroups.

KEY WORDS: *Phimosis; Circumcision; Classification.*

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INTRODUCTION

Male circumcision is one of the most common surgical procedures performed in the world and it is estimated that around one third of men are circumcised for a variety of reasons, including religious, cultural or medical (1). While many studies have been made dealing with the theme of sexual satisfaction and orgasm in males who were circumcised during infancy, the effects on the quality of sexual life, orgasm and sensitivity following circumcision performed in adulthood on patients with phimosis have not been fully clarified (2-3).

Regarding this theme, the systematic revision of literature and analysis show contrasting results (2) and evidence of low quality (3). Probably, this is due not only to a heterogeneity of the studies (3), but also the lack of objective evaluation, relative to the initial clinical conditions of the adult patients' penis prior to circumcision surgery.

Furthermore, in the Systematic Reviews and Meta-analyses (2-5), there is no mention as to whether the considered patients for analysis were circumcised for ritual, esthetic or medical reasons, the most common being sclero-atrophic lichen (6-11), or if the data were mixed all together.

Consequently, if we want to analyze the effects of the circumcision on the quality of sexual life and orgasm in male adults circumcised for medical reasons, we must ask ourselves whether the patients undergoing this intervention all start with the same clinical conditions.

In light of this data, in our opinion, it is therefore reasonable to believe that the differences in the results could be due, in some cases, to the fact that those male samples who got circumcised could have a distribution of the clinical variables that characterize the phimosis in a profoundly different way from each other, and which could affect the quality of the sex life after surgery in a different way.

For example, how could post-operative sexual satisfaction be compared in men with an adherence to glans mucosa or a macroscopic anatomic prepuce alteration or men with sclero-atrophic lichen, or with a condition of a Queyrat erythroplasia to those with an uncomplicated phimosis?

The actually available classification of phimosis in literature, like that of *Kirikos* (12), is insufficient in analyzing sub-groups and rendering the case histories homogeneous and comparable, because they were obtained from a population of boys. *Kirikos* classification doesn't consider either the role of the erection and sexual activity or the presence of eventual clinical comorbidities of the prepuce and penis, which could develop in later life, that could be

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able to modify the context of phimosis in a pejorative sense. In addition, the Kirikos classification doesn't consider the time span of the phimosis, which, in adults, can be of several decades, while in children, the maximum is only a few years.

The primary objectives of this paper are two: 1) to highlight the heterogeneous distribution of the main clinical variables in a non-selected sample of adult males undergoing a circumcision, and 2) to propose a classification of the phimosis for them, able to make clinically homogenous sub-groups, in order to obtain a reliable statistical analysis.

METHODS

This classification is based on the common clinical variables that normally characterize a phimosis, such as the presentation of the phimotic *prepuce* (P) in relation to the state of the penis (in flaccidity or in erection), the severity of the phimosis (G) based on the proportion of the visible glans during the prepuce retraction or difficulty in prepuce sliding (13), the eventual comorbidities associated with the foreskin or penis (Co) and the *timespan* (T) of the phimosis, according to what is referred to in the patient's medical history.

Variable description

The presentation of the phimosis
The fundamental criteria for a consistent and homogeneous application of the classification is to evaluate if the presence of the preputial stenosis and the difficulty in prepuce sliding is observed only in the phase of detumescence, or in the phase of the erection.
This variable is obtained by an attentive medical history. The patient is asked if the glans is visible in the phase of erection, or whether he has had any difficulty in prepuce sliding during an erection, as referred to in a self-reported photo of his erected penis, which is to be brought to the subsequent check-up. We have indicated this variable with the letter "P" for Presentation or Position.
The first variable will be indicated as follows:
P0: Absence of preputial stenosis both at rest and during an erection.
P1: Preputial stenosis visible only during the erection; arbitrarily called here "*functional phimosis*," because connected only to the dynamic state (Figure 1) and leading to prepuce sliding difficulties
P2: Preputial stenosis visible during the retraction of the foreskin, with the penis in the resting position. We arbitrarily call this an "*anatomic phimosis*".

The severity of the phimosis
The second variable of this classification evaluates the severity of the phimosis, according to the amount of the glans exposed during the foreskin retraction. The less visibility of the glans during the foreskin retraction, the greater the severity of the phimosis. Different from the classification of *Kirikos* (12) that considers, at the same time, both the state of the skin and the extension of the phimosis, we've provided for 2 different categories: the severity of the phimosis and the comorbidity, which can be described in a more precise way. We have indicated with G, the grade

of the phimosis severity, and have attributed a score of 0-4 for the progressively worse levels (G0-G4)
G0: Manual retraction of the foreskin consents the visualization of the entire glans and the coronal sulcus is overcome.
G1: Manual retraction of the foreskin consents the visualization of almost all of the glans, without overcoming the coronal sulcus.
G2: Manual retraction consents the visualization of the meatus and half of the glans.
G3: Manual retraction of the foreskin consents to visualize only the meatus (Figure 2).
G4: Visualizing the meatus during manual retraction of the foreskin is impossible (Figure 3). The prepuce is completely closed.

Figure 1.
This patient has a phimosis visible only during erection. The presentation of the phimosis is referred to as functional phimosis or P1 in the PGCT classification.

Figure 2.
In this patient, manual retraction of the foreskin consents to visualize only the meatus. This condition in the PGCT classification is called G3.

Figure 3.
Patient with Grade 4 phimosis, according to the PGCT classification. Visualizing the meatus during manual retraction of the foreskin is impossible. The prepuce is completely closed.

Complexity of prepuce and glans-associated pathologies
The third variable in this classification that best character-izes the phimosis in an adult male, with respect to a child, is defined as the description of eventual other pathologies frequently associated with the prepuce and glans, which can be distinguished during a physical exam. We have indicated this comorbidity variable with the letters C.
The order of the classification of this variable is an ordinal scale of severity/complexity, where the C0 indicates the absence of the pathology.

Figure 4.
Patient with coexisting dermatologic or sexually transmitted pathology such as Condyloma Acuminata, here classified in the PGCT classification as C2.

Figure 5.
Patient with Scleroatrophic Lichen. Phimosis is associated with inflammatory dermatologic pathologies and classified according to the PGCT as C3.

Figure 6.
Patient with Queyrat Disease (on the right) and Verrucous Carcinoma and Squamous Cell Carcinoma (on the left). In the PGCT classification, this leads to a C4 case.

The progression of C1 to C4 corresponds to a greater severity/complexity of comorbidities, reaching higher val-ues, describing pre-cancerous or cancerous lesions.
CX: When this variable is unknown.
C0: No pathology of the penis glans or prepuce, associat-ed with phimosis.
C1: Pathologies of the penis or previous penis surgeries (previous circumcisions, preputial plastic or frenulec-tomy, surgery of cavernous bodies, urethral patholo-gies, history of paraphimosis).
C2: Coexisting dermatologic or sexually transmitted pathologies (Figure 4).
C3: Phimosis is associated with inflammatory dermatolog-ic pathologies (Figure 5).
C4: Phimosis coexists with pre-cancerous and/or cancer-ous pathologies (Queyrat, verrucous carcinoma, squa-mous cell carcinoma) (Figure 6).

This classification could be implemented with a histologic exam, and at that point, there would be "p," as for patho-logic, before the letter "C," that is to say, "pC." In this clas-sification, we have used the clinical evaluation, because the histologic exam is available only after surgery, after the decision to perform the circumcision has been made.

The time span of the phimosis
The last variable refers to the time span of the phimosis, based on the patient's history. During the exam, the patient is asked how much time he has had the phimosis. We have indicated this variable with the letter "T" and have identi-fied it with a number of 2 digits, corresponding to the number of years, in which 01 indicates a time span of less than 1 year, and 02 a time span of less than 2 years, etc.

Setting and participants
Over the past two years, 252 consecutive patients submit-ted to circumcision have been retrospectively evaluated in Rome, Italy and classified on the basis of this PGCT clas-sification. Eight patients were excluded for incomplete data in the charts. The remaining 244 patients were eval-uated for statistical analysis with a minimum follow up of 3 months. Histological examination has been performed in all patients. The ages of these 244 patients ranged from 15 to 91 years old, with an average age of 50.7 years and a mean of 53 years +/- 22.7 SD.
The variables has been collected during our routine clini-cal practice and therefore have been retrieved in the med-ical records of all single recruited patients for this obser-vational study.

Ethics committee
All patients gave their informed consent and were guaran-teed anonymity for both images and data.
The *Rome 2 Ethics Committee*, after has been informed of the whole procedure in accordance with the GPC rules, published the resolution number DD 396 on February 11th 2022.

RESULTS
The results and the 95% *Confidence Limit* (C.L.), according to this classification, are the following and are reported in Table I.

Table 1.

Distribution of phimosis clinical variables according to the PGCT classification in patients circumcised for phimosis.

	Cases	%	IC95%
Presentation of phimosis			
P1	75	30.7%	25.0%-36.0%
P2	169	69.3%	63.1%-75.0%
Total 244			
Grade of phimosis			
G0	75	30.7%	25.0%-36.9%
G1	58	23.8%	18.6%-29.6%
G2	67	27.5%	22.0%-33.5%
G3	30	12.3%	8.5%-17.1%
G4	14	5.7%	3.2%-9.4%
Total 244			
Complexity of associated comorbidity			
C0	118	48.4%	41.9%-54.8%
C1	11	4.5%	2.3%-7.9%
C2	2	0.8%	0.1%-2.9%
C3	105	43.0%	36.7%-49.5%
C4	8	3.3%	1.4%-6.4%
Total 244			
Timespan of phimosis			
< 1 year	141	57.8%	51.3%-64.1%
1-2 years	44	18.0%	13.4%-23.4%
2-10 years	29	11.9%	8.1%-16.6%
> 10 years	30	12.3%	8.5%-17.1%
Total 244			

Presentation P1: 30.73% (C.L. 95%: 25.0%-36.0%), P2: 69.26% (C.L. 95%: 63.1%-75-0%)

Severity G0: 30.73% (C.L, 95% 25.0%-36.9%), G1: 23.77% (C.L.95%: 18.6%-29.6%), G2: 27.45% (C.L.95%: 22.0%-33.5%), G3:12.29% (C.L. 95%: 8.5%-17.1%), G4: 5.73% (C.L.95%: 3.2%-9.4%)

Complexity Associated Penile Comorbidities C0: 48.36% (C.L.95%: 41.9%-54.8%), C1: 4.5% (C.L.95%: 2.3%-7.9%), C2: 0.8% (C.L. 95%: 0.1%-2.9%), C3: 43.03% (C.L. 95% 36.7%-49.5%), C4: 3.27% (C.L. 95% 1.4%-6.4)

Time span: Regarding the results, we have grouped the phimosis time span into 4 periods.

About 57.78% (C.L. 95%: 51.3%-64.1%) of the cases had a phimosis for less than a year; 18.03% (C.L.95%: 13.4%-23.4%) had it for more than one year, but less than 2 years; 11.88% (C.L.95% 8.1%-16.6%) had it for more than 2 years but less than 10 years and about 12.29% (C.L. 95% 8.5%-17.1%) of the cases had a phimosis for more than 10 years.

DISCUSSION

As can be observed in Table 1, 30.73% of the patients in our sample group, who asked to be circumcised, belonged to P1 category, experiencing a "*phimosis*" only during the erection.

Regarding this connection, the term phimosis due to a stenosis of the foreskin that does not allow the glans to be visible during skin retraction, should be re-evaluated and re-defined instead as a sliding disorder of the foreskin (13). In fact, the most frequent definitions of phimosis (14-15) refer only to a retraction disorder of the foreskin

that would not allow the glans to be uncovered. As can be observed in our series, about 30% of the subjects require circumcision due to a preputial stenosis that does not allow the foreskin to slide during erection, despite the glans being completely visible during retraction of the foreskin at rest. According to the classification proposed here, this condition will be classified as P1 G0 (Figure 1). If we analyzed the sub-groups according to the comorbidities, we observed that 43.03% of the patients had inflammatory dermatological diseases and were included in the C3 category.

Such data demonstrates that the male population undergoing a circumcision is not homogeneous in the distribution of the clinical variables that characterize the phimosis. Further, the "*phimosis*" can be considered as being a diagnosis corresponding to a framework composed of completely different clinical pictures, possibly leading to different results and potentially important biases.

Therefore, the proposal of a classification of the genital context has the objective of rendering the results of the circumcision comparable in all of its variables including surgical, esthetic, and that of sexual satisfaction.

Consequently, such a classification containing comparable and useful data, is necessary, in order to define guidelines about circumcision in adult males, which are currently inexistent (15).

In our opinion, this second objective of our paper, the proposal of the clinical classification of phimosis, has three limitations:

The first limitation of this classification is that it deals with a retrospective, rather than a prospective study.

This should be kept in mind in the case that clinical decisions must be taken on the basis of this classification, which, so far, is still only a proposal.

The second limitation is that this classification is primarily clinical because the histological exam can be acquired only after the surgery has been done. As soon as we obtain this histological exam, we can add the letter "p" to the value of the acronym.

The third limitation is that the choice of the 4 clinical variables derives from clinical practice, and that in the future, it could be necessary to add other clinical variables.

Finally, the fourth limitation is that the time variable is obtained by the patients' recollection, which could be imprecise. Nevertheless, in our experience, the patients' recollection is very precise if the time in question is not greater than 3-4 years.

Possible developments

The PGCT (P: presentation, G: grade of severity, C: Complexity of associated comorbidities and T: time span) classification is proposed and offered to researchers and clinicians in order to provide an objective instrument of evaluation that reduces the variability of recruited patients.

In this way, the quality of the Randomized Clinical Trials, Systematic Reviews and Meta-Analyses regarding the quality of the sex life in patients affected by phimosis following a circumcision and in those not circumcised can be improved.

Furthermore, this classification, in defining more homogenous sub-groups, can contribute to identifying and better characterizing the cause-effect relationship for impor-

tant diseases, such as cancer of the penis (16-17). In fact, although there is a lot of evidence demonstrating this relationship, such as the different lifetime risks of penile cancer in circumcised men (1 in 50.000-120.000) (17-18) and in those uncircumcised (1 in 600-900) (19) and the observation that the benefits of the circumcision are greater if the surgery is done precociously (20). However, it has never been demonstrated that the risk of developing cancer increases with the increase of the time span of the onset of phimosis as well as the severity of the disease (21-24).

Also, for other pathologies, an association between phimosis and circumcision and prostate cancer has been described, although not exclusively (25-28). In all of these pathologies, the ability to demonstrate if the risk of getting the pathology increases with time of onset and severity of the phimosis, would provide elements of evaluation regarding public health decisions. In fact, in all of the studies, an association has been reported rather than a causal relationship. Therefore, the public health policy makers could have more elements of evaluation if they could add the variables of time span and severity of phimosis to their various epidemiologic studies, an information never considered until now.

A further application of this classification could be evaluating the *Patient Related Outcomes* (PRO). Comparing homogeneous groups of patients with regards to the initial pathology that had led them to request a circumcision, could have an impact on the choice of surgical techniques, esthetic preferences and on the evaluation of the quality of the patient's sex life after the circumcision.

CONCLUSIONS

The PGCT classification, applied to our sample, shows that adult male patients who require circumcision for phimosis, is heterogeneous for clinical presentation, severity, coexistence of comorbidity and time span. This could be one of the possible reasons for the contrasting data in the sex life quality results of adult males after circumcision in literature.

The classification of more homogeneous sub-groups for these 4 variables could grant an objective and comparable evaluation of the different clinical cases of phimosis.

In addition, it could highlight the possible direct correlation between the severity and persistence of phimosis, with the increasing risk for other important genital pathologies.

Further revision of this classification should be done with a prospective multi-center and larger sample of patients.

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