ROČNÍK LXX • ISSN 0457-4214

2/2021

Odborný časopis
Slovenskej zdravotníckej univerzity
v Bratislave

SLOVENSKÁ ZDRAVOTNÍCKA UNIVERZITA

1951

Indexed in Embase/Excerpta Medica pharmacological and biomedical database
Indexed in Scopus (www.scopus.com)

Lekársky obzor

OBSAH 2/2021

CONTENTS

Šéfredaktor: prof. MUDr. Marián Bernadič, CSc. **Zástupca vedúceho redaktora:** prof. MUDr. Marián Bátovský, CSc. **Výkonní redaktori:** MUDr. Miroslav Žigrai, PhD., a MUDr. Miroslav Kilian, PhD. **Jazyková redaktorka:** PhDr. Helena Bernadičová.

Vydáva Slovenská zdravotnícka univerzita v Bratislave (IČO 00 165 361) v Zdravotníckom vydavateľstve Herba, spol. s r.o., Limbová 12, 833 03 Bratislava; Index. číslo 40341; Evidenčné číslo EV 142/08; tel. 02/5477 6683

Adresa redakcie: Limbová 12, 833 03 Bratislava; **02/5936 0227,** P.O. BOX 53, 837 53 Bratislava 37; e-mail: ***marian.bernadic@fmed.uniba.sk***

Vychádza 12-krát do roka. Celoročné predplatné 30 Eur. Imprimovanie rukopisov 5. 1. 2021. Vyšlo vo februári 2021

Objednávky na predplatné a na inzerciu prijíma: Slovenská zdravotnícka univerzita v Bratislave; Limbová 12, 833 03 Bratislava; predplatne.obzor@szu.sk; 02/5937 0956

Pokyny pre autorov *nájdete na stránke* ***www.lekarsky.herba.sk***

MODEL SUBSTANTIATION OF SURGICAL ACCESS IN MINI-INVASIVE SURGICAL TREATMENT OF PILONIDAL DISEASE IN CHILDREN

Modelovanie a matematické odôvodnenie chirurgického prístupu v mini-invazívnej chirurgickej liečbe pylonidálnej choroby u detí

Viktor KONOPLITSKIY[1], Ruslan SHAVLIUK[1], Dmytro DMYTRIIEV[1], Kostiantyn DMYTRIIEV[1], Serhii MAISTRUK[1], Oleksandr DOBROVANOV[2,3,4], Marián VIDIŠČÁK[2]

[1] National Pirogov Memorial Medical University, Vinnytsia, Ukraine
[2] Slovak Medical University, Bratislava, Slovakia
[3] A. Getlik Clinic for Children and Adolescents: Slovak Medical University and University Hospital, Bratislava, Slovakia, head doc. MD. Katarina Furkova, CSc., assoc. prof.
[4] St. Elizabeth University of Health and Social sciences, Bratislava, Slovakia

SUMMARY
Background: Dissatisfaction with the results of treatment of pilonidal disease in children leads to the search for new ways to improve the methodology of its surgical treatment.
Objective: To create a model for the spatial justification of the form and parameters of surgical access in the treatment of pilonidal disease in children in all forms of it.
Materials and methods: On the basis of anatomical and spatial studies of sacral-coccygeal area in 50 patients with pilonidal disease, the prognostic factors of its course in children have been determined. Thanks to the data obtained, the main conceptual assumptions of the recommendation for the removal of the pathological lesion were identified. In all cases, the developed model of calculation of parameters and localization of operative access allowed to observe the minimally invasive direction of surgical treatment.
Results: Based on the data obtained, the main conceptual assumptions and recommendations for the removal of the pilonidal cyst were identified. In all cases the developed model of calculation of parameters and localization of operative access allowed to observe the minimally invasive direction of surgical treatment. Depending on the location, size and location of the fistulas of the pilonidal cyst, a spatial model, based on the ratio of elliptical planes, allows to determine the necessary parameters of the surgical wound, which allows to maximally lateralize the surgical wound with a minimum area of soft tissue removed.
Conclusions: The formation of contours, localization and parameters of intraoperative access in pilonidal disease in children, according to the developed model of spatial justification of the form and parameters of operative access, testifies to the feasibility of its elliptical shape, the parameters of which are determined by the location of the external openings of the fistulous passages in relation to the relation. The contour of the surgical wound in the form of an ellipse with well-defined geometric parameters of the calculated object allows to perform mini-invasive plastic surgery when removing the pilonidal cyst without additional formation of perianal skin and subcutaneous fat flap, which allows to reduce the number of postoperative lesions. The research was carried out in accordance with the principles of the Declaration of Helsinki. The study protocol was approved by the Local Ethics Committee (LEC) of all the institutions mentioned. Informed agreement was obtained from the parents of the children (or their guardians) for the research.The author declares that there is no conflict of interest.
Keywords: pilonidal disease, children, cyst, spatial model, surgical access.
Lek Obz, 2021, 70 (2): 51-56

Introduction

Surgical relevance of the treatment in patients with pilonidal cysts at the modern stage of medical science development is conditioned by the absence of generally accepted management guidelines, that is convincingly supported by the unsatisfactory high rate of postoperative complications, that amount to 4.2 to 25.0 %, prolonged treatment duration– 30–70 days, relapses after the opening and draining of purulent focus 13.3–95.2%, late hospital admission, usually at the stage of purulent inflammation (12).

The predominant opinion about the pilonidal cyst etiology in childhood is its congenital origin, that an requires excision of all cyst's elements within the healthy tissues (10, 11), together with multimodal approach for the perioperative care (4).

Requirements of modern surgical approaches to the treatment of many diseases, including pilonidal disease (PD), dictate the necessity for the search of miniinvasive organ preserving interventions, that are directed not only at the elimination of disease's cause, but also at the prevention of relapses in the future.

One of this suggested mini-invasive interventions is suggested by J. Bascom (1990) technique of "cleft-lift" (lift off intergluteal cleft), that includes a decrease of intergluteal cleft depth through the local plastic redistribution of the soft issues at the project ion of sacrococcygeal area, which did not spread among domestic surgeons (3, 13).

Depending on the spread of pathological focus in the caudal direction, especially in the presence fistula openings in the lower third of the intergluteal cleft, which is particularly closed to the perianal region, this technique provides for the additional formation and rotation of the round perianal graft. According to the suggested technique, first stage of the operation, after the on-skin marking of the intervention plan, includes asymmetrical excision of the skin graft from one side of the intergluteal cleft and transposition to this area of separated and mobilized fragment of the adipocutaneous graft from the opposite side. Deep layers of the adipose tissues are sutured layer-by-layer on both sides at the second stage of the operation, which cause flattening of the intergluteal cleft due to the formation of "double" adipose layer.

An important condition during marking and following formation of the skin graft, which are planned to be removed, are its borders. Thas medial part of the wound should be as close to the bottom of the intergluteal cleft as possible (that corresponds to the medial line at the posterior surface), and lateral side of the wound should be at the line of natural approximation of the buttocks in the vertical position (defined as the line of buttocks contact with one another at the maximal tension of gluteal muscles in standing position) (2).

These techniques have substantial limitations. Formation of the lateral graft border, that is excised, depends a lot on the localization of the external opening of pilonidal cysts, and its borders are often hard to define and perform excision, that lead to the excessive tension of the sutured tissues and prolonged pain syndrome in the postoperative period, starting from the first day, especially during walking and siting (8, 15). Another limitation is a necessity of perianal skin graft formation (1). Formation of this geometrical rounded figure can be feasible at the flat surface, but loss its predicted feasibility in the convex configuration of the coccygeal region. Most of modern scientists define 3 portions in the external anal sphincter – subcutaneous, superficial and deep, each of which is divided by layers of connective tissue into different sections, that goes from the end of*m. levator ani*. Maximal amount of the sections are located in the subcutaneous part of the external anal sphincter, that are conditioned by the features of the closure function of the muscles of distal part of anal channel, which walls should tightly connect to each other in order to prevent involuntary defecation. The area of transversal section of muscular fibers depends more on the constitution and age, but is not connected with sex (9). In general, abase of external (voluntary) anal sphincter, that is located at the area of pelvic fundus, ism. striatus which is a continuation of m. puborectalis. Length of the external anal sphincter is 2.5 to 5 cm in average, which subcutaneous part consists of circular muscular fibers; deep layer is connected with puborectal muscle. Supportive structures of the external anal sphincter, that provides for the retention of gases and feces, are arteriolo-venous formation, cavernous tissues and connective network (6).

Taking in to account anatomical features of the external anal sphincter structure, formation of perianal graft of such complicated form can cause injury of the subcutaneous and superficial layers of the external anal sphincter with the development of persistent defecation problems (ecnopresis). An impairment of blood supply of this element is possible due to the damaging of microvascular bed with the following development of graft necrosis. Close location of the suture line to the anus can promote suppuration of the postoperative wound through the contamination with autoflora (7, 14).

Some studies already approached question of area modeling of superficial functional and anatomic objects in pediatric surgery (5), so this approach seems interesting for modern science.

So, any study, that will improve treatment outcomes is particularly relevant for modern pediatric surgery.

The aim of the study is to create a spatial model for the substantiation of the form and parameters of operative approach in surgical treatment of pilonidal disease in children, including fistular and non-fistular forms.

Materials and methods

Study is based on the result of investigation and operative treatment of 47 children at the age from 11 to 17 (average age–15.7±1.03 years), that were treated in the Surgical Department No 1 of Vinnytsia Regional Clinical Children Hospital for the period of 2018-2019. The division by gender was the following – 21 girls and 26 boys. Morphometric investigation of the pelvis parameters and intergluteal cleft region was performed in all patients. We performed radical operative treatment of pilonidal cyst in 24 children (6 according to Bascom II technique and 18 according to the technique developed by authors).

Study was performed in alignment with Declaration of Helsinki. Protocol of the study was approved by the Local Ethic Committee (LEC). Informed consent of parents (or caregiver) was obtained prior to any study-related procedures.

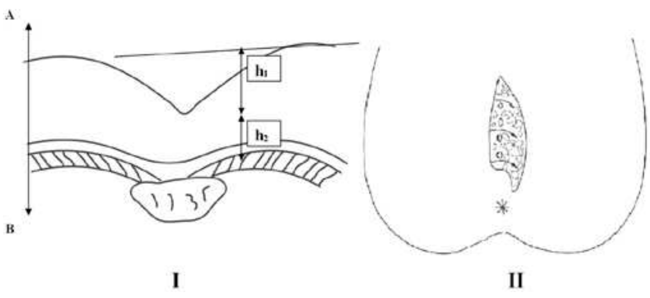
Results and discussion

The first stage in the creation of model of spatial substantiation of form and parameters of the operative approach in the treatment of PD in children was development of main conceptual assumptions – recommendations for the excision of PD focus in each particular case:

1. Excised skin fragment to get her with tissues in sacrococcygeal area is considered as an ellipsoid due to: volume of this figure, that is obtaine after the rotation of ellipse around it's main symmetry axis, is minimal; after creation of incision line of this figure scalpel moves along the tangent line to the incision surface, which under this conditions compounds ellipse form, that corresponds to the incision process with the minimal friction force and higher predisposition to the primary healing.
2. Simulated point of fistulae should be projected on the line, that is parallel to the focus ellipseline; interval received on this line from the border points of fistulae should be equal to this focus distance, that allows for planning optimal geometry of the incision surface.
3. The surface of fistulae accumulation is located in one of the elipse's semisurfaces, and another semisurface should close wound after the operation, the exclude necessity for the additional skin perianal graft.
4. Surface of fistulae is located in side the right triangle for the convenience of preoperative geometrical planning; we found transverse axis of the incision surface and vertical axis of the calculated scheme at the section of medians of this triangle, that minimize the volume of skin fragment with adipose tissues, that should be excised during the operation; longitudinal axis of incision surface is built in parallel to one of the medians of the mentioned triangle at the level of most distantly located fistulae.

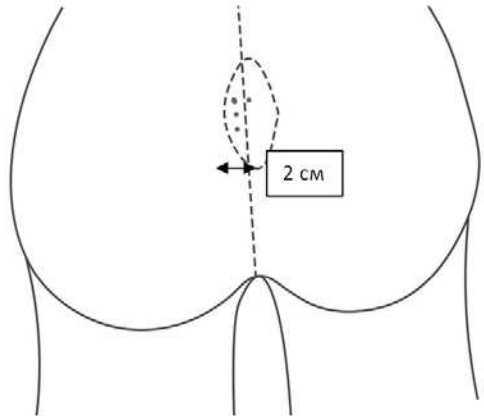
We take into account, that the value, that can always change – is general wound length, that depends on the individual cyst size, which is determined clinically or by US, MRI, fistulography relatively to the intergluteal graft projection. 2 marker points are determined according to this prior to the operation: **A** – superior wound border, **B** – lower wound border, loction of which is conditioned by several individual parameters, that include: $\mathbf{h_1}$ – intergluteal cleft depth, $\mathbf{h_2}$ – skin and adipose tissue thickness (from skin to the sacral fascia) (Fig. 1).

Figure 1. Scheme of values, + that can change individually. I – probable longitudinal size of the operative wound; II – variable values of the anatomical objects of sacro-coccygeal area. Source: Authors' own processing.



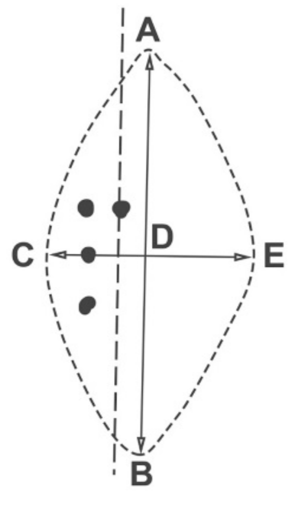
When the operation approach plan is made we should account for the localization of the secondary fistulae at the distance > 3.0 cm from the median line, that make slow-trauma plastic interventions according to J. Bascom or G.E. Karydakis, because this procedures provide for the ellipsoid incision with the deviation from the median line of < 2.0 cm (13) (Fig. 2).

Figure 2. Scheme of operative approach in Karydakis procedure. Source: Authors' own processing.



The next important parameter of the operative wound is width, **C↔E** distance, with corresponding intervals **C↔D** and **D↔E** relatively to the median line and localization of the fistulae openings (Fig. 3).

Figure 3. Scheme of the length and width parameters of the operative wound. Source: Authors' own processing.



An important part of this scheme is a possibility of calculation depending in the individual anatomical values of $\mathbf{h_1}$ and $\mathbf{h_2}$, values of **A↔B**, **C↔D** and **D↔E**, as this is directly related to: the degree of tension after the suturing of opposite skin grafts; depth (length) of separated skin-adipose tissue from the side of **C↔D** during «lift» (or a decrease of depth in other words) of the intergluteal cleft in the projection of excised pilonidal cyst as one of the main method for the prevention of relapses of pilonidal cyst (Fig. 4).

Figure 4. Scheme of the required depth of the separated skin-adipose tissue. Source: Authors' own processing.

It is obvious, that in children advent age should be given to the technique of the flattening of the intergluteal cleft for the prevention of the PD relapse. As height and body weight continue to increase, height of the intergluteal cleft can decrease due to the increase of adipose and muscle tissue in buttocks. So further improvement of the technique of operative intervention is a relevant part of the pediatric surgery.

So the next step of our study was a creation of the model of spatial substantiation of the form and parameters of operative approach, based on the previously determined conceptual suggestion.

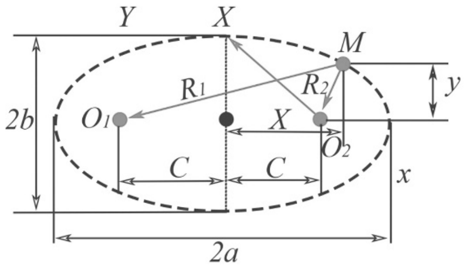
Graphic-analytical analysis of the developed model is built as certain assumptions.

Assumption No 1

Determination of geometrical features of the surgical approach surface, which section has an ellipse form. **M** point – the point of localization of the external fistula opening (Fig.5).

For ellipse: $R_1 + R_2 = 2a$; $R_1 = \sqrt{(x+c)^2 + y^2}$; $R_2 = \sqrt{(x-c)^2 + y^2}$

Figure 5. Main parameters of the ellipse (surface of the surgical approach). Source: Authors' own processing.



$$\sqrt{(x+c)^2 + y^2} + \sqrt{(x-c)^2 + y^2} = 2a;$$

$$\sqrt{(x+c)^2 + y^2} = 2a - \sqrt{(x-c)^2 + y^2}$$

$$x^2 + 2cx + c^2 + y^2 = 4a^2 - 4a\sqrt{(x-c)^2 + y^2} + x^2 - 2cx + c^2 + y^2$$

Hence: $4a\sqrt{(x-c)^2 + y^2} = 4a^2 - 4cx \Rightarrow a\sqrt{(x-c)^2 + y^2} = a^2 - cx$, where

$$a^2((x-c)^2 + y^2) = a^4 - 2a^2cx + c^2x^2$$

$$a^2x^2 - 2a^2xc + a^2c^2 + a^2y^2 = a^4 - 2a^2cx + c^2x^2$$

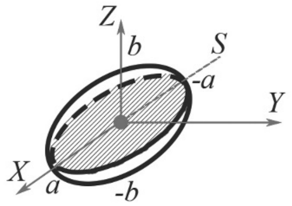
$$x^2(a^2 - c^2) + a^2y^2 = a^4 - a^2c^2 = a^2(a^2 - c^2):$$

Assumption No 2

Determination of geometrical features of the surface of surgical approach.

Figured formation of the operative approach surface along the tangential line to the curvilineal surface is most rational, so sought volume is located as a body of ellipse or ellipsoid rotation (Fig. 6).

Figure 6. Scheme of ellipsoid as spatial figure of the formation of surgical approach surface. Source: Authors' own processing.



$x = 0 \Rightarrow \frac{y^2 + x^2}{a^2} + \frac{z^2}{c^2} = 1$, so classical equation of ellipsoid is (Fig. 7, 8, 9):

$$\frac{x^2}{a^2} + \frac{y^2}{a^2} + \frac{z^2}{c^2} = 1$$

Figure 7. Scheme of the possible location of fistulae within the ellipsoid. 1 – triangle of the fistulae localization; 2 – relative points of fistulae; 3 – semi-ellipsoid of the operative approach surface: a – operative approach surface; b – volume of the operative approach. Source: Authors' own processing.

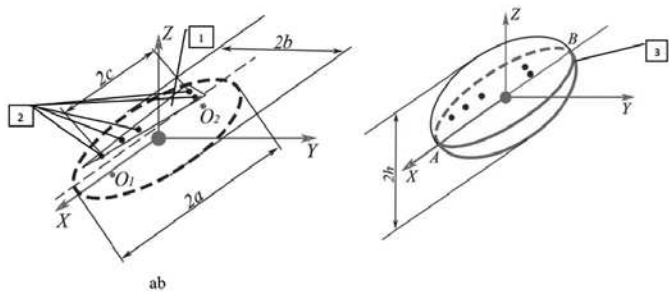


Figure 8. Choice of the scheme of the operation approach formation within the surface of the location of external fistular openings. 1 – external fistular openings; 2 – spinal axis conducted from spinous processes; 3 –semi-ellipsoid surface of the operative approach; 4 – median of the triangle. Source: Authors' own processing.

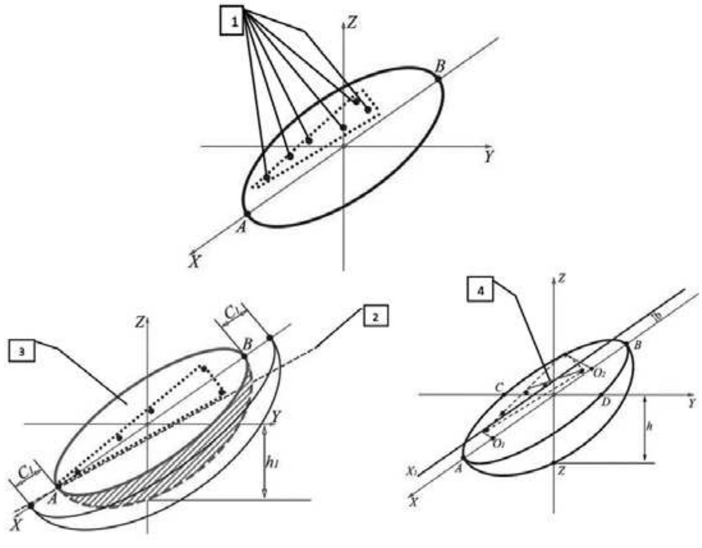
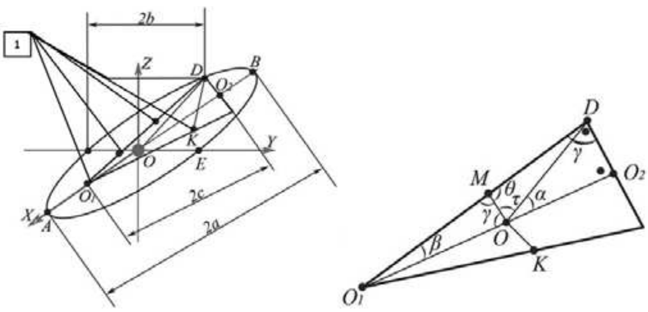


Figure 9. Schemes of the calculation of the operative approach surface. 1 – external fistular orifices. Source: Authors' own processing.



$$O_1D = R_1 \qquad O_2D = R_2 O_1D + O_2D = 2a = R_1 + R_2 O_1O + OO_2 = O_1O_2 = 2c$$

$$\Delta O_1O_2D \Rightarrow O_1D = R_1 = \sqrt{O_1O_2^2 + O_2D^2} = \sqrt{4c^2 + R_2^2}$$

$$\Delta ODO_2 \Rightarrow O_2D = R_2 = \sqrt{OD^2 - OO_2^2} = \sqrt{OD^2 - c^2}$$

$$\Delta O_1OM \Rightarrow \gamma = 90 - \beta\theta = 180 - \gamma = 90 + \beta$$

$$\cos\beta = \frac{O_1O_2}{O_1D} = \frac{2c}{R_1} = \sin\beta = \sqrt{1 - \cos^2\beta} = \sqrt{1 - \frac{4c^2}{R_1^2}}$$

$$\Delta OO_2D \Rightarrow \tan\alpha = \frac{O_2D}{OO_2} = \frac{R_2}{c} 90 + \tau + \alpha = 180 \Rightarrow \tau = 90 - \alpha$$

$$\Delta O_1DO \Rightarrow \frac{O_1D}{\sin(\tau + 90)} = \frac{OD}{\sin\beta} \Rightarrow \frac{R_1}{\sin(180 - \alpha)} = \frac{OD}{\sin\beta} \Rightarrow \frac{R_1}{sin\,\alpha} = \frac{OD}{sin\,\beta}$$

$$OD = \frac{R_1 \sin\beta}{\sin\alpha} = \frac{R_1\sqrt{1 - \frac{4c^2}{R_1^2}}}{\sin\alpha} \Delta ODO_2 \Rightarrow OD = \sqrt{OO_2^2 + O_2D^2} = \sqrt{c^2 + R_2^2}$$

$$\frac{O_2D}{OD} = \sin\alpha \Rightarrow OD = \frac{O_2D}{\sin\alpha} = \frac{R_2}{\sin\alpha}$$

Then:

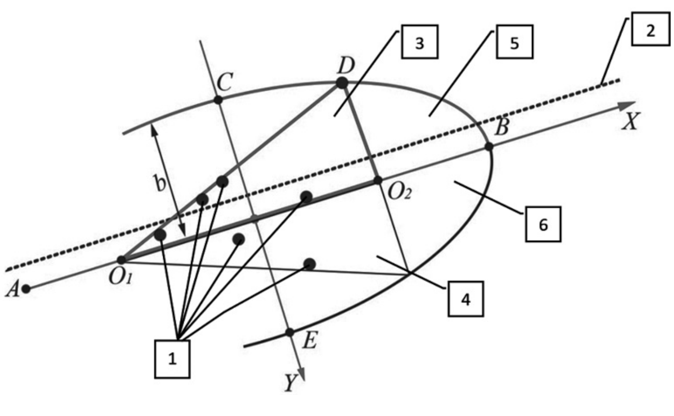
$$\frac{R_2}{\sin\alpha} = \frac{R_1\sqrt{1 - \frac{4c^2}{R_1^2}}}{\sin\alpha} \Rightarrow R_2 = R_1\sqrt{\frac{R_1^2 - 4c^2}{R_1^2}} = \sqrt{R_1^2 - 4c^2}$$

than: $R_1 + R_2 = \sqrt{4c^2 + R_2^2} + \sqrt{R_1^2 - 4c^2} = 2a$

$$R_2^2 = R_1^2 - 4c^2 \Rightarrow R_1^2 - R_2^2 = 4c^2 \Rightarrow (R_1 - R_2)(R_1 + R_2) = 4c^2 \Rightarrow$$

$$(R_1 - R_2) \times 2a = 4c^2 R_1 - R_2 = 2\frac{c^2}{a} b = \sqrt{a^2 - c^2} \qquad \Rightarrow \qquad b^2 = a^2 - c^2$$

Figure 10. Scheme of the calculation of the ellipse parameters for the operative approach surface. 1 – external fistular openings; 2 – spinal axis conducted from spinous processes; 3 – relative surface of the operative approach; 4 – relative surface of the postoperative wound closure; 5 – actual surface of the operative approach; 6 – actual surface of the postoperative wound closure. OX – axis of the operative approach surface. Source: Authors' own processing.



If $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, for $\tau D(x, y) \quad y = O_2D = R_2 \quad x = OO_2 = c,$

than $\frac{c^2}{a^2} + \frac{R_2^2}{b^2} = 1 \Rightarrow \frac{c^2}{a^2} + \frac{R_2^2}{a^2 - c^2} = 1$

$$\frac{R_2^2}{a^2 - c^2} = 1 - \frac{c^2}{a^2} = \frac{a^2 - c^2}{a^2} \Rightarrow R_2^2 = \frac{(a^2 - c^2)^2}{a^2}$$

$R_1 = R_2 + 2\frac{c^2}{a} = \frac{a^2 - c^2}{a} + \frac{2c^2}{a} = \frac{a^2 + c^2}{a}$ (Fig. 10).

Sequence of the determination of the parameters of operative approach surface:

I stage – construction of the rectangle between the points of the external fistular opening and determination of the axis of the operative approach surface.

II stage –calculation of the ellipse's focus distance:

III stage – calculation of the focal radiuses for the most distantly located fistular opening:

IV stages– calculation of the main ellipse's parameters:

$$AB = R_1 + R_2 = 2a \Rightarrow \qquad a = 0.5(R_1 + R_2)$$

$$b = \sqrt{a^2 - c^2} = \sqrt{0.5^2(R_1 + R_2)^2 - 0.5^2 O_1O_2^2} = 0.5\sqrt{(R_1 + R_2)^2 - O_1O_2^2}$$

Ellipse's eccentricity $\varepsilon = \frac{c}{a} = \frac{0.5O_1O_2}{0.5(R_1 + R_2)} = \frac{O_1O_2}{R_1 + R_2}$

Focus distance is determined as a distance, that connect external fistular openings in the longitudinal direction, more precisely their projection on the line, that is parallel to the focus distance .

Conclusions

Formation of contours, localization and parameters of intraoperative approach in PD in children according to the developed model of spatial substantiation of the form and parameters of operative approach, indicates viability of ellipsoid form. Parameters of them are determined by the location of external fistular openings relatively to the intergluteal cleft. Contour of the operative wound in the form of ellipse with clearly determined by the geometrical parameters of calculated object provides for the mini-invasive plastic surgical interventions in the excision of pilonidal cyst without additional formation of perianal skin-adipose graft, that allows to decrease amount of postoperative complications and relapses and improve treatment quality and outcomes.*

*Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

References

1. ABO-RYIA M.H., ABD-ALLAH H.S., AL-SHAREEF M.M., ABDULRAZEK M.M.: Fascio-adipo-cutaneous lateral advancement

flap for treatment of pilonidal sinus: A modification of the Karydakis operation-cohort study. World J. Surg, 2017, 12: 93-105.
2. BALI I., AZIRET M., SOZEN S.: Effectiveness of Limberg and Karydakis flap in recurrent pilonidal sinus disease. Clinics (Sao Paulo), 2015, 15: 350-355.
3. BASCOM J.: Surgical treatment of pilonidal disease. BMJ, 2008, 366: 868-871.
4. DMITRIEV D.V., KATILOV O.V., KALINCHUK O.V.: The role of early enteral nutrition in multimodal program „fast track" surgery in children. Klin Khir, 2014, 9: 36-38.
5. DMUTRIIEV D.V., KONOPLITSKYI D.V., IANOVYCH V.P.: New approaches for determination of area of superficial functional and anatomic objects in pediatric anesthesiology and surgery. Klin Khir, 2015, 1: 55-57.
6. DOLGIKH O.B., SOLOVJEV O.L., STOLYAROV S.A., SUPILJNIKOV A.A.: Gemorroj. Samara: Reviaz, 2013, 152 p.
7. DOLL D., MATEVOSSIAN E., LUEDI M.M.: Does full wound rupture following median pilonidal closure alter long-term recurrence rate? Med Princ Pract, 2015, 6 (24): 571-577.
8. HAIDER K., ASHFAQ A., ISHTIAQ A.K.: Pilonidal sinus: a comparative study of open versus closed methods of surgical approach. JIIMC, 2017, 2: 111-115.
9. KARTASHKIN V.A., SAPIN M.R., SHESTAKOV A.M.: Osobennosti stroeniya naruzhnogo sfinktera pryamoj kishki u detej razlichnogo vozrasta. Rossijskij mediko-biologicheskij vestnik, 2010, 1 (18): 18-24.
10. KONOPLITSKYI V., SHAVLIUK R., DMYTRIIEV D., DMYTRIIEV K. et al.: Pilonidal disease: changes in understanding of etiology, pathogenesis and approach to treatment. Wiad Lek, 2019, 72 (8): 1559-1565.
11. LURIN I.A., TSEMA I.E.V., YAKIMOV D.Y.U., MAKAROFF H.H. et al.: The Results of Minitraumatic Surgical Treatment of Patients with Chronic Pilonidal Sinus Disease with Using Bascom's Procedure - Cleft Lift Procedure. Ukrainian Journal of Minimally Invasive and Endoscopic Surgery, 2013, 17 (4): 15-21.
12. RUSAK O.B.: Substantiation of the effectiveness of the use of Octenisept® antiseptic in the treatment of epithelial coccygeal suppuration. Scientific Journal Science Rise, 2015, 10 (3): 153-157.
13. SANZ N.M., ROS E.P., CIFUENTES A.S.: Modified Karydakis procedure for giant pilonidal sinus. GIR ESP, 2016, 10 (94): 606-613.
14. STAUFFER V.K., LUEDI M.M., KAUF P.: Common surgical procedures in pilonidal sinus disease: A meta-analysis, merged data analysis, and comprehensive study on recurrence. Sci Rep, 2018, 8: 30-58.
15. TITOV A.Y.U., KOSTAREV I.V., BATISHHEV A.K.: Etiopatogenez i khirurgicheskoe lechenie epitelialnogo kopchikovogo khoda. Russian Journal of Gastroenterology, Hepatology, Coloproctology, 2015, 2: 69-78.

Received 31. 8. 2020.

Corresponding author:
MUDr. Oleksandr Dobrovanov, PhD., MBA
The Hospital of Saint Cyril and Metod, A. Getlik Clinic for Children and Adolescents,
Slovak Medical University and University Hospital
Antolska street 3361/11
85107 Bratislava, Slovakia
E-mail: *brovan.oleksandr@gmail.com*