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Usefulness assessment of preoperative MRI fistulography in patients with perianal fistulas

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Summary

Background: Accurate preoperative assessment of the perianal fistulous tract is the main purpose of the diagnostics and to a large extend determines surgery effectiveness. One of the useful diagnostic methods in perianal fistulas is magnetic resonance imaging. The authors presented experiences in the application of MRI fistulography for evaluation of cases of perianal fistulas difficult to diagnose and treat.

Material/Methods: Own examination method was described; MRI fistulography findings were analyzed and compared with intraoperative conditions in 14 patients (11 men and 3 women) diagnosed in the years 2005–2009. Eight patients had recurrent fistulas and 6 had primary fistulas. Imaging was performed with a GE SIGNA LX HS scanner with a 1.5-Tesla field strength and a dedicated surface coil placed at the level of hip joints. Contrast agent was a gadolinium-based solution.

Results: Intraoperative findings were consistent with radiological descriptions of 13 MRI fistulographies. Only in one case, according to surgery findings, it was a transsphincteric fistula with an abscess in the ischioanal fossa, with an orifice in the posterior crypt; the radiologist described it as a transsphincteric, internal blind fistula.

Conclusions: Due to its accuracy in the assessment of the perianal fistulous tracts in soft tissues, MRI fistulography becomes a useful and recommended diagnostic method in this pathology. It shows the location of the fistula regarding the system of anal sphincters, and identifies the internal orifice and branching of the fistula. It enables precise planning of surgical treatment. Authors suggest that this diagnostic method should be improved and applied more commonly.

Key words: MRI • fistulography • perianal

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Background

Perianal fistula is a chronic inflammation of perianal tissues, which is usually caused by an abscess. In most of the cases, the track of the fistula has a relatively straight course between the external orifice and the internal orifice in the anal canal (usually a posterior crypt). There is also a group of fistulas with a complex, branched and high course, especially in patients after previous surgeries or patients with Leśniowski-Crohn disease.

Difficulties in the assessment of such tracts may lead to unsuccessful "blind" attempts at tract delineation during surgery. These attempts may be followed by formation of a false canal and orifice, and, in consequence, by unnecessarily extensive surgery. Furthermore, "blind" operation

favours the formation of pathological granulation tissue – inflammatory foci, while a too aggressive or too conservative operation causes disease recurrence or development of complications such as anal sphincter injury and a faecal incontinence.

The aim of this study was to present own experiences in the application of Magnetic Resonance fistulography in imaging and assessment of perianal fistulas for qualification of patients to surgical procedure.

Material and Methods

On the basis of the literature, it was decided to perform the first MRI fistulography. First, it was determined empirically what concentration of paramagnetic gadolinium-based contrast agent (rare earth element) should be administered into the fistulous tract. To this end, test tubes with a volume of 2 cm^3 were filled with 1 cm^3 of saline solution, followed by 1, 2, 4, 8, 16, 32 drops of contrast agent added with a 7-0 needle. Test tubes were placed in muscle tissue of animal origin (pork neck from the butcher's). The most appropriate concentration was found to be two drops of gadolinium added with a 7-0 needle to 1 cm^3 of saline.

Right before the MRI examination, the gadolinium solution was prepared ex tempore and administered in the volume of a few cm^3 into the external orifice of the fistulous tract using butterfly cannula without a catheter. Subsequently, the external orifice was covered with plaster dressing with gauze. The examination was performed with a 1.5 Tesla scanner, manufactured by GE SIGNA LX HS, with a dedicated surface coil placed at the level of hip joints. The following sequences were used: SE, TSE and TSE+fs; T1- and T2-weighted images were acquired in sagittal, coronal and transverse planes with slice thickness of 4 mm and a 1-mm gap.

There were 14 patients with perianal fistulas examined (11 men, 3 women), aged from 38 to 64 years (mean 54 years). Eight patients had recurrent fistulas and 6 had primary fistulas. Next, MRI images were compared with surgical findings, which were decided to be referential and definitive. During operation, 3% hydrogen peroxide and /or methylene blue was introduced into the fistulous tract.

Results

MRI examination showed, according to the Park's classification, 5 intersphincteric, 6 transsphincteric, 1 suprasphincteric and 2 extrasphincteric fistulas. Additionally, 2 fistulas were multiple (with 2 internal orifices), in 3 cases there was a complex fistula, including 2 cases of horseshoe fistula. Intraoperative findings matched the radiological description of 13 MR fistulographies. In one case, according to the operative report, there was a transsphincteric fistula with an abscess in the ischioanal fossa and with orifice in the posterior crypt. It was interpreted by the radiologist as transsphincteric internal blind fistula.

Discussion

Perianal fistulas constitute a heterogenic group of pathologies of the terminal part of the gastrointestinal tract and perineal area, jointly termed as anorectal malformations [1]. These are canals filled with granulation tissue and surrounded by thick fibrous tissue. Most of the fistulas are of glandular origin – cryptogenic – and a relatively straight, slightly elliptical tract starting in the perianal area, with the internal orifice in the anal canal, at the level of the crypt. Very rarely fistulas develop in the course of colitis ulcerosa, Leśniowski-Crohn disease, or tuberculosis. The portals of infection may include anal fissure, postoperative wounds, anal injuries, and neoplasms of that area. Their course and natural history are frequently untypical. The main role in pathophysiology of fistula formation is played by the location and the number of perianal glands specific for that region, as well as the direction in which the infection spreads along anatomical planes [2,3]. More prone to complications are patients on immunosuppression, HIV-infected [4–6]. The Park's classification, based on the course of the fistulous tract with regard to the external sphincter of the anus, divides perianal fistulas into four main types: intersphincteric, transsphincteric, suprasphincteric and extrasphincteric. An additional group includes fistulas located superficially, subcutaneously [1,2,7,8]. Other subtypes of fistulas found in the nomenclature (simple, complex, multiple, high, recurrent) are related to the fistula course, presence of additional canals and openings and type of previous treatment. These factors determine also the method of treatment. In our study, apart from Park's classification, we also used the term 'recurrent fistula', i.e. fistula which developed after previous, unsuccessful surgery, 'complex fistula' (frequently recurrent) located above the puborectalis sling, with branches often directed vertically, upwards and not towards the central part of the anal canal, with internal orifice above the linea pectinata, and 'multiple fistula' (frequently complex) with multiple openings – internal and external orifices. Fistulas without an internal orifice are the internal blind fistulas. Sometimes, the purulent process with its starting point in a posterior, middle gland, after penetrating the external sphincter of the anus keeps on penetrating soft tissues, creating a bypass to the retrorectal space – that is how a horseshoe fistula is formed.

Initial diagnostics of perianal fistula is based on history-taking and physical examination which should include a detailed anal inspection with a rectal examination. This allows for a correct diagnosis in 48% of cases [8]. Approximately 5% of fistulas have a difficult, branched, complex course, with the tract reaching above the puborectal muscle. Frequently, the internal orifice is narrowed, small or periodically closed. If the internal orifice with an infected intersphincteric gland is not removed, and if all additional canals of the fistula are not found and properly drained or also removed, then the probability of recurrence is high. Many failures of surgical treatment are related to insufficient identification of the fistula course, or failure in finding all of the branches or internal orifices. Additionally, difficult anatomical conditions limit aggressive diagnostics and treatment before and during surgery, due to the concern of sphincter injury and subsequent fecal incontinence.

Symptoms related to the fistula usually appear after a few days, weeks or months from acute infection – perianal abscess. The most frequent complains of patients with fistula are: pulsating pain, gradually increasing leakage from a

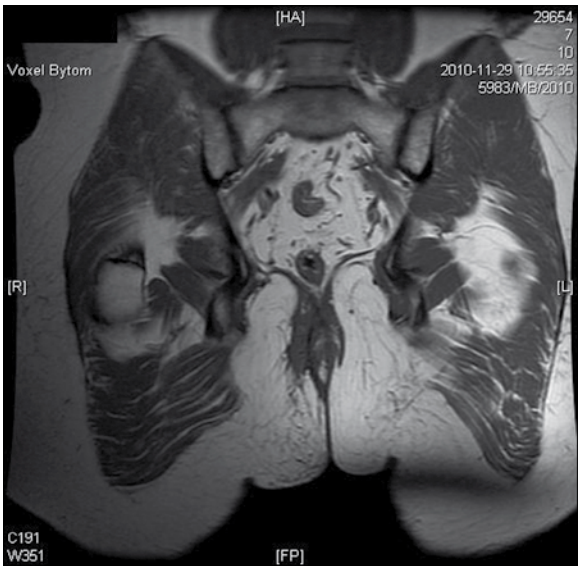

Figure 1. MR examination, coronal T1-weighted images. Right-sided intersphincteric fistula.

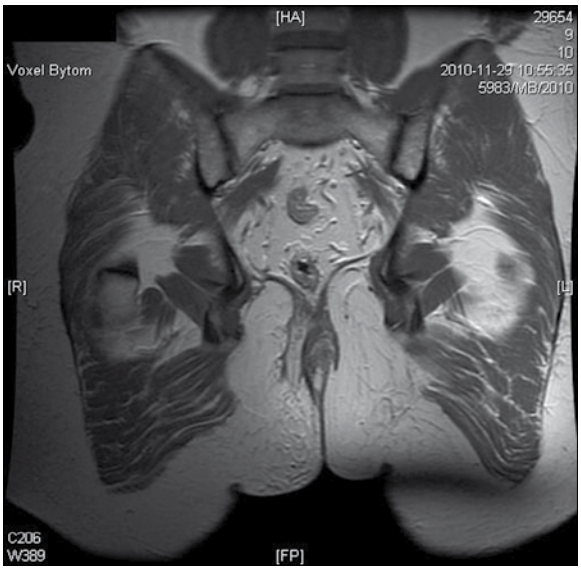

Figure 2. MR examination, coronal T1-weighted images. Right-sided intesphincteric fistula; fistulous canal filled with a contras agent injected through the external orifice.

cutaneous orifice – exudative or purulent, less often an exudate or pus from the anus, and recurrent symptoms of an abscess. Complains are chronic or recurrent in their nature.

There are three main radiological imaging techniques in perianal fistulas which are essential in the evaluation of the fistula extent, type of tissues involved and presence of additional inflammatory or purulent foci, location of external and internal openings of the fistula, and the course of the main canal and potential additional branches. They include: contrast fistulography, endorectal ultrasonography and magnetic resonance imaging [2,9–11]. Each of these methods is related to some benefits, as well as limitations; they are used interchangeably in inconclusive cases. Diagnostic tests are extremely helpful in the evaluation of the precise extent of surgical procedure.

The least frequently used method – fistulography – is helpful only in visualization of the main canal of the fistula; the sensitivity of that method, according to different authors, ranges from 24% to 50%. Additional branches, frequently filled with granulation tissue, are not accessible for a contrast agent administered during that test [12–14].

The main non-invasive imaging method of parianal fistulas is currently the endoanal ultrasonography (EAUS) and ultrasonography with a contrast agent (3% hydrogen peroxide), which is becoming more popular and accurate. However, in many cases, EAUS is not able reveal high pathological lesions (suprasphincteric), subcutaneous lesions, of horseshoe type, or smaller additional branches. According to many authors, it may be used only for assessment of postsurgical condition of the sphincters and prior to small surgeries, as incision or drainage [2,3,18–20].

Nowadays it is believed that most of doubts can be solved with magnetic resonance imaging (MRI) (Figures 1, 2).

This method allows better visualization of fistulous canals and location of purulent collections, and enables precise assessment of surrounding soft tissues, much more accurate then with EAUS.

Buchanan et al. [21] in their study showed that MR increases the accuracy of diagnosis by 10% in comparison to EAUS. Additionally, there was a threefold decrease in recurrence rate after surgical interventions based on appropriate diagnostics with the use of MR only. Maier et al. [18] showed a statistically higher efficiency in the detection of perianal fistulas and abscesses in 39 patients with the use of magnetic resonance (84% sensitivity) as compared to endosonography (60% sensitivity). False-positive results were present in 6 patients (15%) examined with MR and in 10 (26%) examined with endosonography. Beets-Tan et al. [12] assessed the usefulness of the method by comparing the results of MRI in patients before surgery with intraoperative findings. They proved that its sensitivity and specificity for fistulous canal detection amounted to 100% and 86%, respectively. For a horseshoe fistula this was 100% and 100%, and for internal openings – 96% and 90%.

The sensitivity of the method can increase after the administration of gadolinium-based contrast medium into the fistulous canal. The use of MRI fat-suppression sequences (fat sat) helps in detailed analysis of fistulous canals filled with the highly hyperintense contrast agent surrounded by hypointense background (Figure 3, 4).

On the other hand, intravenous administration of the contrast agent enables visualization of infectiously changed fistulous walls, which intensively enhance and are then more visible.

However, a relatively low accessibility and high price of MRI limits its common use as a diagnostic method in perianal fistulas.

In our study, the type of fistula was identified in all patients on the basis of conducted MR fistulographies,

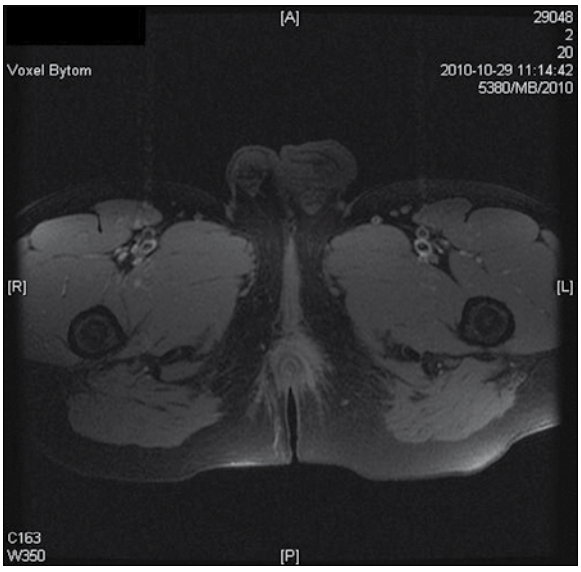

Figure 3. MR examination, transverse T1-weighted images with fat saturation. Horseshoe fistula.

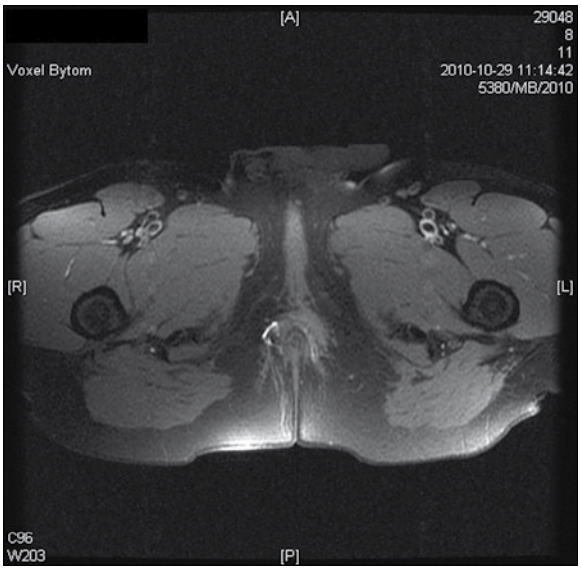

Figure 4. MR examination, transverse T1-weighted images with fat saturation. Horseshoe fistula; fistulous canal filled with contrast agent.

which allowed for an adequate preparation of patients and surgical team prior to surgery. One case of recurrent fistula with an abscess was interpreted as internal blind and trans-sphincteric. Its internal outlet was not visualized which was probably related to an insufficient amount of contrast administered.

The effectiveness of commonly used surgical methods depends on many factors. Sangwan et al. [20] proved that the recurrence rate in patients after surgery due to a simple perianal fistula was about 6.5%. According to authors, treatment failure was usually related to the inability to find the internal opening of the fistula. Other causes were: additional canals not visible in the examinations, incorrect assessment of the course of the fistulous tract, presence of a horseshoe fistula and premature wound closure after fistulotomy [20,22].

Treatment of fistulas includes classic surgical procedures: fistulotomy, fistulotomy with marsupialization, fistulectomy, seton placement, internal orifice closure using advancement flap repair [23,24]. Additionally, tissue glues and antibiotic-containing sponges introduced into fistulous canals are used [25–27] However, the selected method depends on the type of the fistula, its location regarding the sphincters and on the experience of the surgeon, who always remembers about the main postoperative complications such as transient or permanent fecal incontinence and fistula recurrences.

Special recommendations are connected with fistulas that developed in the course of Leśniowski-Crohn disease, because a complete disease remission allowing the fistula to heal is extremely rare. Extensive surgery is contraindicated. Treatment is not needed in asymptomatic fistulas (without purulent leakage). A simple, low-located fistula is treated only with an incision; healing takes about 6 months in such cases. A complex fistula is treated only with seton placement, which helps to drain purulent fluid from the fistula and prevents spreading of the inflammatory process (antibiotic therapy). Sometimes, mucosal advancement flap repair can be used, but an absolute contraindication to this kind of treatment is an active inflammatory process of the rectal mucosa. In the healing process of such fistulas, infliximab is used as a conservative treatment method in combination with surgery [23,27–32].

In our case, fistulectomy, fistulotomy with marsupialization, 5 procedures with seton placement and 3 fistulectomies with advancement flap repair were carried out.

Conclusions

Preoperative precise localization of the fistulous tract with its internal and external orifice is the main purpose of the diagnostics in perianal fistulas and, to a large extent, determines the effectiveness of surgery.

Based on our experience and on literature review, we believe that MR fistulography with the use of gadolinium contrast agents meets these requirements.

MR fistulography improves the diagnostic effectiveness in the assessment of the fistulous course. It shows the location of the fistula in relation to the rectal sphincters and identifies its internal and external orifices as well as additional branches. This allows precise planning of surgical treatment, and thus improves its effectiveness.

Due to high costs of the examination, indications for MR fistulography in Poland are still being limited. However, we think that this diagnostic method should be popularized and improved as much as possible.

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