Prevention of post-coccygectomy infection in a series of 136 coccygectomies

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Abstract Postoperative infection is a regular complication in coccygectomy. The authors propose the use of a topical skin adhesive on the postoperative wound as a contribution to the prevention of this complication. It was used on the first 56 patients in this study. The rate of infection was 3.6% compared with the 14% rate of infection in a previous study. The 80 following patients had, in addition to the skin adhesive, two prophylactic antibiotics for 48 hours (cefamandole and ornidazole), a preoperative rectal enema, and closure of the incision in two layers. The rate of infection dropped to 0.0%. Topical skin adhesive constitutes a significant contribution in the prevention of infection after coccygectomy.

Introduction

Surgical coccygectomy is proposed for patients with chronic coccygodynia resistant to conservative treatment.

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This operation has proved to be effective in up to 90% of cases. However, the procedure remains encumbered with a rate of postoperative infection indicated in the literature as being up to 30% [1]. The number of consultations for coccygodynia in our hospital department has enabled us to gain significant experience in the treatment of this disorder which nevertheless remains rare. Given the considerable number of coccygectomies that we are called upon to perform, we have tried to reduce the risk of postoperative infection. This paper reports our progress in the prevention of infection, in particular through the use of a topical skin adhesive.

Patients

From June 2002 to June 2009, 1172 patients with chronic coccygodynia were examined and treated in our department. The initial treatment was conservative. If this failed, coccygectomy was proposed when the imaging techniques showed that a lesion was present. This could be an instability of the coccyx (luxation in the sitting position or hypermobility), visible only on dynamic radiographs, or a morphological abnormality (spicule or dysplasia) [2–4]. During this period, 136 patients were operated upon by the same surgeon (L.D.) following a previously described operative technique [5, 6]. There were 24 men and 112 women with an average age of 46 years (range 18–75). The diagnoses are presented in Table 1.

Methods

The coccygectomy technique was the same for all patients, but surgical closure and perioperative care was different in

Table 1 Apportionment of diagnoses in our series of operated patients. The cases of dysplasia were either giant spicules (4 cases) or human tails (2 cases)

Posterior luxation	Hypermobility	Anterior luxation	Spicule	Dysplasia	Total
64	21	6	39	6	136

the first 56 cases as compared to the subsequent 80 cases (Table 2).

Operative technique

The posterior aspect of the coccyx was directly approached through a small longitudinal incision (about 5 cm) in the gluteal cleft. The coccyx was exposed by subperiosteal dissection. In case of instability, the dissection progressed through the disc between the sound and the mobile segment and anterior release of the coccyx performed as described by Key [7], i.e. working from the proximal to the distal part. In the case of instability, the coccyx segment(s) furthest from the abnormal disc was removed. In the case of spicule, only the coccyx segment with the spur was removed and in the other cases, the dysplastic segment was removed. The wound was closed over a suction drain.

Surgical closure

In the first 56 cases, only the skin was closed. In the subsequent 80 cases, the wound was closed in two layers—one deep layer, for which absorbable sutures were used, and a skin layer closed with nylon sutures. Topical skin adhesive was applied on the wound in all cases (see details below).

Perioperative care

In the first 56 cases (from June 2002 to April 2005), we used the following protocol: prophylactic antibiotics administered over a period of 48 hours with an injection of 1.5 g cefamandole at the beginning of the procedure followed by an IV infusion of 1.5 g every eight hours (i.e. 4.5 g per day for 48 hours) and protection of the incision with 2-octyl cyanoacrylate (Dermabond® Ethicon).

Perioperative care was modified from May 2005. The 80 patients operated upon after that date had a reinforced

protocol of perioperative care with a rectal enema the evening before the procedure and inclusion of a second antibiotic with the cefamandole, namely, ornidazole at 1 g per 24 hours for 48 hours. Protection of the incision was ensured with Dermabond® Ethicon in 25 patients and with Enbucrilate (Histoacryl® B. Braun Aesculap) in 55 patients.

In all cases, the dressing was performed with great care to ensure that the healing wound would be strictly isolated from the anal verge. After operation patients remained in hospital for a week and the dressing was changed every second day without removing the film of skin adhesive. The sutures were removed on the ninth or tenth day after the procedure. Upon discharge, the patients were instructed to rest for three weeks with a very progressive return to the sitting position according to their level of pain.

Statistical analysis

Rates of postoperative infection were compared between different groups of patients using the χ^2 test. Simple logistic regression analysis was used to quantify the association between postoperative infection and variables likely to reduce the risk (use of skin adhesive, use of reinforced perioperative care), expressed as crude odds ratios (ORs) and 95% confidence intervals (95% CI). A multivariate logistic regression model was adjusted for variables associated with postoperative infection at a significance of $p < 0.1$ in univariate analysis, in order to calculate adjusted ORs. All results with p values < 0.05 were considered to be statistically significant. The KyPlot software package was used for statistical analysis.

Results

In the first series of 56 patients operated upon with a single prophylactic antibiotic over 48 hours, closure of the skin only and without preoperative rectal enema, there were two

Table 2 Surgical closure and perioperative care in the first 56 cases as compared to the subsequent 80 cases of our series

Patient group	Period	Enema	Closure	Skin adhesive	Prophylactic antibiotics
Cases 1–56	June 2002 to April 2005	No	One layer	Dermabond	Cefamandole
Cases 57–136	May 2005 to June 2009	Yes	Two layers	Histoacryl / 55 cases Demabond / 25 cases	Cefamandole Ornidazole

Table 3 Rates of postoperative infection in a previous series and the actual series

Series	<i>n</i>	Period	Skin adhesive	Other perioperative care	Postoperative infection, <i>n</i> (%)	<i>p</i>
Previous series [6]	61	1993–2000	None	Classical ^a	9 (14.8)	<0.001
Actual series	<i>N</i> = 136	June 2002 to June 2009	Yes	Classical then reinforced ^b	2 (1.5)	
Patients 1–56	56	June 2002 to April 2005	Yes	Classical	2 (3.6)	NS ^c 0.08 ^d
Patients 57–136	80	May 2005 to June 2009	Yes	Reinforced	0	<0.01 ^e

^a Classical care = no enema, 1 layer-closure, cefamandol only

^b Reinforced cares = enema, 2 layers-closure, cefamandol + ornidazole

^c Comparison between group 1–56 and group 57–136

^d Comparison between group 1–56 and previous series

^e Comparison between group 57–136 and previous series

cases of postoperative infection with enterobacteria, or an infection rate of 3.6%. These two patients were cured by repeat surgery and three weeks antibiotic treatment. In the following series of 80 patients operated upon with two prophylactic antibiotics over 48 hours, closure in two layers and with preoperative rectal enema, there were no cases of postoperative infection (0.0%).

Discussion

The large number of patients operated upon in this study needs to be measured against the 1,172 patients examined during the same period. This high figure is related to the specialised nature of our department, which receives patients with chronic coccygodynia from throughout the country.

Surgical coccygectomy performed on correctly selected patients is credited with good results in the literature [5, 8–16]. The major problem with this procedure, apart from recruitment, is that of infection. Without altering the final result, it does appreciably lengthen the recovery period [5,

6]. The figures published up to 2004 ranged from 6% to 16% infection [5, 8–10]. In 2004, Wood et al. reported six cases of superficial infection out of 20 coccygectomies [1]. The patients had received prophylactic antibiotics over a period of 48 hours. These infections were treated non-operatively with two weeks antibiotic treatment. In 2006, Balain et al. reported a single case of superficial infection, treated with oral antibiotics, out of 38 coccygectomies operated over a period of 16 years [14]. In 2007, Cebesoy et al. reported no cases of infection out of 21 coccygectomies, all having received prophylactic antibiotics for a period of at least five days [16].

The study by Doursounian et al. published in 2004 reported 14% infection in a series of 61 patients operated upon from 1993 to 2000 with two schedules of prophylactic antibiotics [6]. The authors concluded then that treatment with prophylactic antibiotics over 48 hours was preferable to peroperative flash prophylactic antibiotics, but that other factors could be involved, such as resorbable subcutaneous sutures, dressing, and rest. They noted that, despite all the care taken with the dressing, it was difficult to guarantee

Table 4 Risk factors of postoperative infection following coccygectomy

Variables	<i>n</i>	Postoperative infection, <i>n</i> (%)	Crude OR ^b	95% CI	<i>p</i>	Adjusted OR ^c	95% CI	<i>p</i>
Skin adhesive								
No	61	9 (14)	1			1		
Yes	136	2 (1.5)	0.88	0.82–0.94	<0.001	0.89	0.82–0.97	<0.01
Perioperative care ^a								
Classical	117	11 (9.4)	1			1		
Reinforced	80	0	0.91	0.85–0.97	<0.01	0.96	0.89–1.04	NS

^a Classical = no enema, 1 layer-closure, cefamandol only; reinforced = enema, 2 layers-closure, cefamandol + ornidazole

^b Crude odds ratios (determined by univariate analysis) were calculated by means of simple logistic regression analysis

^c Adjusted odds ratios were calculated using a multiple logistic regression model which was constructed with variables that were associated with postoperative infection in univariate analyses

isolation of the wound postoperatively in some patients where the incision was close to the anal margin. This observation led us to use a topical skin adhesive to cover the wound before putting on the dressing. This adhesive is marketed as replacing the need for skin sutures, but we used it over the suture stitches to create a protective film for the wound against regional germs. The change in brand of adhesive which occurred in the second series of patients was not voluntary. Following a rupture in supply of Dermabond® at our hospital, we were obliged to momentarily change adhesive and use Histoacryl® without seeming to have changed the results in any way. This application of topical skin adhesive, in addition to all the other prevention measures (i.e. prophylactic antibiotics over 48 hours, strict rest for one week and drain for three days), enabled us to observe the absence of postoperative infection in the first 42 procedures of the study, or for a period of two years. Thereafter, two cases of infection with enterobacteria close together made us reconsider our practice. In the first case, the strain isolated, *Escherichia coli*, was moderately sensitive to first and second generation cephalosporins. In the second case, the strains isolated, *Escherichia coli* and *Proteus mirabilis*, were sensitive to first and second generation cephalosporins. These classes of antibiotics are recommended in prophylactic antibiotic protocols for clean/clean-contaminated surgery, in particular in the case of implantation of joint implants or spinal surgery [17, 18]. Their activity is mainly directed against Gram-positive cocci (staphylococcus, streptococcus) and certain wild enterobacteria. The incidence of two cases of infection of the incision site showed the limits of this type of antibiotic prophylaxis and led to a change in practice. An imidazole (ordinazole) was added so as to extend the activity of antibiotic prophylaxis to anaerobic bacteria of the faecal flora, by analogy with the models of antibiotic prophylaxis in proctological surgery. We also started to use a preoperative rectal enema. The object being to reduce faecal stasis and to thus limit colonisation of the wound, close to the anal margin, by enterobacteria in the faecal flora. To our knowledge this prophylactic measure has not been mentioned by any other author. Sehrioglu et al. [15] mention that: “a constipating or low residue diet was prescribed to patients to prevent postoperative wound contamination”. Fogel et al. [19] in a review article state that “the patient should take an oral mechanical bowel preparation, such as polyethylene glycol solution, the day before surgery.”

In addition, the manifest effect of the topical skin adhesive in the first two years of its use, as well as a desire to retain the greatest thickness possible of the soft tissue between the coccyx and the skin, led us to reconsider our single layer incision closure technique and we began to close in two layers.

Overall, the rate of postoperative infection among patients was only 1.5% (2/136) following application of topical skin adhesive, and was thus significantly lower than in our previous report [6] (9/61 patients, i.e. 14.8%; $p < 0.001$) (Table 3).

In order to assess the respective impact of each postoperative measure to prevent postoperative infection, we performed a simple then a multiple logistic regression analysis (Table 4); application of topical skin adhesive was identified as the unique independent factor for protection from postoperative infection (OR=0.89, 95%CI [0.82–0.97], $p < 0.01$). However, when application of topical skin adhesive was associated with reinforced perioperative measures (rectal enema, reinforced prophylactic antibiotic regimen, closure in two layers), the rate of postoperative infection fell to 0%. Overall, this final strategy seems to be the most effective.

One last point remains to be proved, that of the necessity for the postoperative suction drain. We have used it on a regular basis except in a few rare cases where, for favourable anatomic reasons (very thin patient and coccyx very superficial), there was no cavity to drain. But it is difficult for us, having found an effective procedure, to change one of the parameters.

Conflict of interest statement The authors declare that they have no conflict of interest related to the publication of this manuscript.

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