

German National Guideline on the management of pilonidal disease: update 2020.

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Three types of disease manifestation could be differentiated: asymptomatic disease, an acute abscess, and the chronic pilonidal disease. At present, there is no treatment method fulfilling all desired criteria: simple, painless procedure associated with rapid wound healing, and low recurrence rate. Thus, treatment modality should be tailored to disease manifestation and extent.

Asymptomatic pilonidal disease should not be treated. A pilonidal abscess should be unroofed. After resolution of the acute inflammation, the disease should be treated definitely. As for today, sinus excision is the standard treatment of the chronic pilonidal disease. Wide excision and open treatment of chronic disease is a safe procedure which, however, leads to prolonged secondary healing and time off-work, as well as to considerable recurrence rate. The extent of excision should be as limited as possible. Excision and midline wound closure is associated with impaired outcomes. Today, it has become obsolete. Minimally invasive procedures (e.g., pit picking surgery) represent a treatment option for chronic pilonidal disease. However, the recurrence rate is higher compared to excision procedures. Nevertheless, they may be used for small primary disease. Off-midline procedures should be used for disease not suitable for minimally invasive treatments. The Limberg flap and the Karydak procedure are two best described methods which are associated with similar short- and long-term results.

In 2014, German National Guideline on the Management of Pilonidal disease was published first in German and 2017 in English language [1]. Since then, there has been an ongoing research on

pathogenesis and treatment of pilonidal disease worldwide. In the recent decade, minimally invasive methods like endoscopic and laser treatments emerged and gained some popularity. Moreover, the use of laser procedures to prevent postoperative recurrences has been described. Also, numerous publications and reviews on off-midline procedures increased the quality of the overall body of evidence. Nevertheless, traditional midline excision is still widely used in most countries. This article represents an updated consensus review of pilonidal disease management based on best current evidence. Find the summary of recommendations of the current Guideline Update in Appendix .

Starting from previous Guideline published in German language 2014, the authors identified topics for inclusion. All invited authors accepted participation and received instructions for the literature search. PubMed and Cochrane databases were used to identify relevant contributions from April 2014 (end date of the search for the previous Guideline version) and May 2019. Medical Subject Headings terms were used, as were accompanying entry terms for patient group, interventions, and outcomes. Key words included "pilonidal*," "sinus," and "201*." Searches were limited to studies published in English and German languages and focusing on human subjects. Titles and abstracts were screened by individual reviewers to identify potentially relevant articles. Thereafter, full publications were read by three principal reviewers (I.I., D.D. and A.O). Relevant papers in German language published in journals not listed in the MEDLINE Database after 2013 were included, because the Guideline was mainly aimed on medical providers in countries with German language.

Levels of evidence were assessed according to criteria developed by Centre for Evidence-Based Medicine, Oxford, UK [2] for therapy/prevention/etiology/harm questions and using GRADE criteria [3]. The Graduation of Recommendations is illustrated by Fig. 1 and Table 1 . Due to COVID-19 pandemic, no consensus meeting was held. The conclusions of the current Guideline were sent by e-mail to all members of Guideline committee, and responses to Delphi method questionnaire were recorded. The Guideline committee consisted of representatives from specialist societies involved in treatment of pilonidal disease: surgical societies (Deutsche Gesellschaft der Koloproktologie, DGK; Berufsverband der Coloproktologen Deutschlands, BCD; Chirurgische Arbeitsgemeinschaft für Coloproktologie, CACP; Deutsche Gesellschaft für Allgemein- und Viszeralchirurgie, DGAV), the dermatological society (Deutsche Dermatologische Gesellschaft), and the gastroenterologist society (Deutsche Gesellschaft für Verdauungs- und Stoffwechselkrankheiten). The strength of the consensus was defined as demonstrated in Table 2 . Current Guideline update had been pre-published 2020 [4] in German language in coloproctology . However, it did not appear in any PUBMED-cited journal previously. The present manuscript is a shortened English version of the current update; thus, its content was held as close as possible to the German version. The preparation of the present Guideline was assisted by the Association of the Scientific Medical Societies in Germany (Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften, AWMF). AWMF represents Germany in the Council for International Organizations of Medical Sciences CIOMS and is authorized to issue national guidelines. Fig. 1 Transformation process from level of evidence to grade of recommendation. Recommendations are based not only on level of evidence of available studies but also on preferences, applicability, cultural traditions, values, etc.

Diagram illustrating classification of recommendation

No principal changes to the previous version of Guideline have been done. Surgery for asymptomatic disease is not recommended [5]. No spontaneous disease progression had been observed in an observational study [6]. In contrast, a complete spontaneous remission of symptomatic disease is unlikely. Thus, surgery is indicated for symptomatic cases.

There is no indication for prophylactic treatment in patients with asymptomatic disease. In contrast, symptomatic disease can be cured only by surgery. Timing of intervention is dictated depending on whether an acute abscess or chronic disease is present. For diagnostic purposes, only patients' history and physical examination are implied.

Incision and drainage (I+D) is indicated in most cases of acute pilonidal abscess, although needle aspiration followed by antibiotics has been described by some authors [7 , 8]. Long-term recurrence-free healing can occur following I+D [9]. In the previous version of this Guideline, definitive excision was recommended as an alternative to simple I+D in case of small abscesses. However, in the present version, I+D is the preferred method for all acute abscesses.

Incision and drainage is indicated in most patients with pilonidal abscess. Elective surgery should be performed after resolution of acute inflammation.

Favorable results following minimally invasive phenol treatment have been described previously [10 – 17]. Recently, Calikoglu et al. [18] demonstrated similar long-term recurrence rate (23% vs. 15% after 4 years) and significantly shorter sick leave after crystallized phenol injection as compared with open excision in a prospective randomized trial including 140 patients. Yet, due to its presumed toxicity [19], treatment by phenol is not allowed by German health authorities. Thus, the final statement stays unchanged to the previous version of the Guideline.

Despite favorable results in recent studies, the human use of phenol has been banned by German health authorities due to its toxicity.

There are numerous variations of minimally invasive techniques to treat pilonidal disease. Also, different names are used. However, principal steps are common in most descriptions which include minimal excision of midline pits and some type of cleansing or drainage of the secondary tracks and cavities [20 – 23]. Gips et al. [24] used trephines instead of knife and cleaned the underlying cavity more intensively. The latter study is one of the most often cited publications on minimally invasive pilonidal treatment without use of laser or endoscopes. The main advantage of pit picking [21 , 23] and all other minimally invasive techniques is minimal pain and short time out of work.

The recurrence rate following pit picking and similar procedures is expected to be 8–26% between 12 and 120 months after surgery; however, there are various definitions of recurrence following minimal procedures making comparisons between studies difficult. In a recent retrospective study by Khodakaram et al., 241 patients [25] were treated either by open healing or by a “modified Lord-Millar” procedure which is predecessor of the pit picking surgery. Authors reported on 23% recurrence rate 3 years after the modified Lord-Millar procedure. The results were comparable between both methods. The only prospective randomized study was conducted by Nordon [22] and compared pit picking (which was called “simple Bascom technique” in that publication) to cleft lift. The recurrence rate was 24% after 36 months in the pit picking group.

Pit picking and its variations should be used in previously untreated patients with minimal disease. There is still lack of reliable long-term results.

Sinusectomy was first described by Soll et al. 2008 [26] as “limited excision.” The method was named “sinusectomy” by same authors in their follow-up study 2011 [27]. The midline pits and sinus are closely excised with the scalpel or scissor following the dye-marked track. Sinusectomy is performed under local anesthesia in most cases [27]. The main difference to pit picking and its variations is a complete (subcutaneous) excision of the sinus tract. The main difference to the traditional excision surgery is a close tracing of the tract instead of wide excision. Since the first description of the method 2008, there are few additional studies and no one since publication of the previous version of the Guideline [28 – 31].

The reported recurrence rates after a follow-up period of 20 to 43 months are 1.6–7%. The method is limited to patients with less than 3 pits. Two prospective randomized studies [29 , 31] compared sinusectomy (“sinus excision”) to traditional excision with or without marsupialization. The recurrence rate after sinusectomy was 0% after 10 months in one [29] and 3% after > 15 months in another [31] study.

Sinusectomy can be considered as a minimally invasive procedure for treatment of locally limited pilonidal disease. However, there is still a considerable scarcity of data to draw definite conclusions.

This method was not included in previous version of the Guideline. At surgery, a probe or a forceps is placed into the fistula tract and the latter cut open without complete excision. An additional curettage may be added. The wound is left open to heal; however, it is considerably narrower than after wide excision. Thus, the surgery can be done as an outpatient procedure.

A meta-analysis by Garg et al. [32], including 13 retrospective series, demonstrated a 4.5% recurrence rate, a healing time of 21–72 days and time out of work of 8 days. Unfortunately, in 5 of included studies, marsupialization has been used, thus hampering the final conclusions.

Due to lack of reliable data, no formal recommendation can be given for laying open procedure.

Endoscopic treatment was not discussed in the previous version of the Guideline. During the recent decade, numerous publications demonstrated the technical feasibility and favorable short-term results of endoscopic treatment. The technique of the method includes minimal excision of the midline pits and video-assisted cleansing of the subcutaneous tracts. The advantage of the method, at least the theoretical one, is the fact that the tracts are treated under vision in contrast to pit picking or laser treatment. The method is best known as EPSiT (endoscopic pilonidal sinus treatment) [33 – 37]. In the study by Milone et al. [37], 145 previously untreated patients were randomly assigned either to EPSiT or cleft lift. There was prolonged time out of work in cleft lift group, whereas 1-year recurrence rate (3%) and infectious complications were similar in both groups. Four years later, the follow-up study does not have been published yet.

Two systemic meta-analyses [38 , 39] including 497 patients, demonstrated treatment failure of only 8% (recurrences in 4% and persistent disease in 4%), the average time out of work of 3 days, and healing time of 33 days following endoscopic treatment. However, the Guideline committee criticized the fact that most evidence is arising from only few centers. Thus, present evidence does not justify higher costs as compared with simpler minimally invasive methods.

Due to lack of reliable data, no formal recommendation can be given for endoscopic treatment.

Laser treatment represents another minimally invasive method which was introduced into the Guideline for the first time. Again, midline pits are excised with a small amount of skin and the most distal part of the fistula tract is opened. Thereafter, a radial fiber delivering laser energy is introduced into the sinus tract which is cleaned and sealed by withdrawing the fiber. There are several names for the procedure, most popular of which are PiLaT (pilonidal laser treatment) [40] and Silac [41]. Some retrospective series reported on 90% healing rates after laser procedures; however, there are no prospective randomized comparisons with other minimally invasive procedures. Pappas et al. [41] demonstrated healing rate of 78% after multiple laser procedures in 237 patients previously treated by other methods after 1 year of follow-up.

Due to lack of reliable data, no formal recommendation can be given for laser treatment.

Despite increasing use of minimally invasive and off-midline procedures, the open healing is still the method most frequently used worldwide and also in Germany. The main drawbacks of the method are prolonged wound healing and time out of work. The wide discrepancies in reported recurrence rates from as low as 2–6% [42 – 48] to 15–35% [49 – 57] are likely caused by different patient selection and recurrence definitions. The recurrence rate is particularly high in patients undergoing excision and open healing for recurrent disease. It was 20% after 20 years in one study [58], but as high as 42% in another [59].

After open healing, a proportion of patients develops chronic midline wound. Repeat surgery can lead to even larger non-healing wound, especially, when open healing is used again. A disabling

long-standing disease can result. Unfortunately, exact incidence of chronic postoperative wounds after excision and open healing is not known. It was at least 6% in one prospectively randomized study [60].

Numerous randomized studies [49 , 61 – 63] have been conducted to compare open healing with midline closure. Most studies—except one [49]—failed to demonstrate a significant difference in recurrence rates between both methods; however, the healing time was significantly prolonged in open healing [64]. Open healing was compared with Limberg flap in two prospectively randomized trials showing an increased recurrence rate after open healing in one (33% vs. 4%) [53] but not in another [60]. In a meta-analysis by Stauffer et al. [65] including more than 89,000 patients, the 10-year recurrence rate was 20% after open healing, 2% after Karydakis flap, and 11% after Limberg flap.

Wide excision and open healing is a simple treatment. Excision should be tailored to the extent of disease and stay as limited as possible. However, according to actual meta-analyses, main drawbacks are prolonged wound healing and time out of work, and an increased recurrence rate as compared with off-midline procedures*.

*German Dermatological Society (Deutsche Dermatologische Gesellschaft, DDG) did not agree with that particular conclusion. According to DDG, the meta-analysis by Stauffer et al. [65] does not provide sufficient evidence for an increased recurrence rate after wide excision.

Little has been added to the body of evidence since the publication of the last version of the Guideline. Excision and marsupialization of the wound was associated with shorter healing time (3–4 weeks) [66 , 67] and shorter time off-work (0.5–1.5 months) [45 , 59 , 68] than open healing without marsupialization in older studies. Reported recurrence rates were as low as 0–10% [45 , 59 , 68]. In a retrospective study by Doll et al. published 2015, patients reported to be less satisfied after marsupialization as compared with other surgical techniques 7 to 28 years after pilonidal surgery [69].

Due to lack of reliable data, no formal recommendation can be given for marsupialization.

After excision and midline wound closure, a considerable incidence of wound dehiscence ranging between 14 and 74% [47 , 70 – 80] has been frequently described and confirmed by recent randomized trials which compared midline closure to Limberg flap [70 , 78 , 81 – 83]. Also, a significantly increased recurrence rate after midline closure as compared with Limberg flap (4–45% vs. 0–4%) was demonstrated by latter studies 6 to 46 months following surgery. Consequently, a meta-analysis by Al Khamis et al. recommended to abandon the midline closure due to frequent wound problems and increased recurrence rate [64].

A tension-free midline closure has been described by some authors previously [84] and, recently, by Sevinc et al. [85] and Youssef [86]. The technique includes a subcutaneous release at the level of fascia of gluteus maximus muscle as wide as 3–5 cm leading to flattening of the wound after midline closure. The recurrence rates after 24 months were 6% in the Limberg and Karydakis groups and 4% in the tension-free primary closure group in the randomized study by Sevinc et al. [85].

Midline closure should not be used due to high incidence of wound dehiscence and an increased recurrence rate.

No additional evidence on V-Y-flap [87 , 88], Z-plasty [89 , 90], and Dufourmentel flap [91 , 92] has been added since publication of the previous version of the Guideline. The reported results are similar to that after Karydakis flap, Limberg flap, and Cleft lift. However, these methods did not gain wide acceptance. Almost all reports are older retrospective series.

Rarely used off-midline procedures play only a limited role in Germany. Thus, they cannot be recommended.

During the last 15–20 years, studies addressing Karydakis flap reported on recurrence rates between 0 and 6% after 10 years, wound dehiscence rates between 8 and 23%, time out of work of 2–3 weeks, and hospital stay of 0–3 days [93 – 99]. In a meta-analysis by Prassas et al. [100 , 101] including several prospective randomized trials, similar wound healing and recurrence rate were documented for Karydakis and Limberg flap with less seroma formation following the latter. In 2010, Cochrane review found a “clear benefit in favor of off-midline rather than midline closure, which should be the standard management when closures of sinuses is desired” [64].

Karydakis flap should be considered as one of preferred off-midline procedures.

There were no substantially new findings regarding cleft lift procedure since the publication of the Guideline 2014. The technique was developed by J. Bascom as a modification of the Karydakis flap during the early 1980s; however, it is still not widely used despite of encouraging results even in most difficult cases [102]. The reason for hesitant adoption of cleft lift lies probably in difficulties to understand how exactly the incision line is drawn. Similarly to Karydakis flap, recurrence rate is low—0 to 5% after 10 years—despite of negative patient selection [103 , 104]. The wound dehiscence which is caused mainly by infection of subcutaneous seroma is a frequent occurrence (15–40%). However, that high incidence of wound problems might be as well caused by high proportion of recurrent cases in study populations. In only randomized trial, Nordon et al. [22] demonstrated significantly lower recurrence rate following cleft lift as compared with pit picking 13 months after surgery (0% vs. 24%).

Cleft lift should be considered as one of preferred off-midline procedures. Main drawbacks of the procedure are difficulties to understand the marking and a trend towards an increased rate of wound complications.

Limberg flap is the best described off-midline procedure to treat pilonidal disease including several randomized trials [82 , 105 – 114]. In its original form, Limberg flap leads to crossing of the wound and the natal cleft which is the frequent point of non-healing wound dehiscences. Therefore, the “modified” Limberg flap was developed to achieve a complete lateralization of the postoperative wound. Accordingly, in studies comparing original technique to the modified one, the latter is associated with the lower rate of recurrences and wound complications [106 , 107 , 115]. Numerous [70 , 78 , 81 , 82 , 111 , 114 , 116] randomized studies compared Limberg flap to midline closure or open healing reporting on better results after Limberg flap. In two recent meta-analyses [117 , 118], Limberg flap along with Karydakis flap was proposed to be the first choice when non-minimally invasive methods are intended.

Limberg flap should be considered as one of preferred off-midline procedures. The modified technique should be used instead of the original one in order to avoid postoperative wound crossing the midline.

The use of the fibrin glue was not discussed in the previous version of the Guideline. Authors of some recent studies used fibrin glue mostly in conjunction with some type of minimal excision of midline pits [119 – 121]. In a retrospective study by Sian et al. including 146 patients undergoing mere curettage of sinus tracts followed by fibrin glue application, a healing rate of 96% could be achieved after at least two fibrin treatments: encouraging results given the low invasiveness of the procedure [122]!

Due to lack of reliable data, no formal recommendation can be given for fibrin glue treatment.

The use of platelet-rich plasma or autologous adipose tissue as adjunction to some type of pilonidal treatment, mostly to midline or off-midline closure, has been described by some authors recently [

46 , 123 , 124]. Reduced postoperative pain and faster wound healing has been described; however, any advantages in recurrence rate have not been reported as for today.

Due to lack of reliable data, no formal recommendation can be given for autologous tissue treatments.

The benefit of placing subcutaneous drainage is still matter of controversial discussions. In two studies [99 , 125], subcutaneous drainage significantly decreased incidence of postoperative wound dehiscence after Karydakis flap. In contrast, Colak et al. [109] found that drainage placement was associated with a two-fold increase in wound complication rate after Limberg flap. A meta-analysis by Milone [126] failed to clear the matter either.

Due to a lack of reliable evidence, a formal recommendation on postoperative subcutaneous drainages could not be given.

Although popular for decades, the efficacy of postoperative shaving has been questioned recently [127]. Moreover, sharp-ended rootless hairs have been found in sinus cavities of patients [128], commonly, shortly after haircut [129]. Thus, a permanent depilation by laser or depilation cream instead of shaving might be, at least theoretically, the preferred method for recurrence prophylaxis. Some recent case series reported on improved postoperative recurrence rates after pilonidal surgery when postoperative laser depilation was used [130 – 132]. However, in a prospective randomized study by Demircan [133], patients undergoing postoperative laser depilation after Karydakis flap demonstrated a significantly increased risk of disease recurrence. In a systematic review, Pronk et al. [134] showed a slightly decreased postoperative recurrence rate when laser depilation has been used after surgery. However, the evidence was not strong enough to make definite conclusions.

Due to a lack of reliable data, a formal recommendation on use of postoperative laser depilation could not be given. Laser depilation could be considered individually as recurrence prophylaxis in young patients with a positive family history presenting with recurrent disease.

Three national Guidelines have been published as for today: the Italian [135], the American [136], and the present German National Guideline. Unfortunately, some contrasting conclusions could be found there.

An increasingly critical view on open healing is expressed by German and Italian Guidelines. Impaired quality of life, prolonged, and expensive wound treatment and, furthermore, considerable time off-work are recognized as major disadvantages as compared with wound closure. However, American Guideline puts it on surgeons' and patients' preference whether to use open healing, marsupialization, or off-midline procedures. The latter methods were criticized for their requirement of "particular experience, skills and comfort with flap-based procedures." Also, marsupialization seems to be quite popular in the USA, whereas Italian authors did not mention and German Guideline completely refused this method.

A unanimous abandonment of midline wound closure can be found in all three Guidelines because of high incidence of wound breakdown and an increased recurrence rate. As a consequence, all authors recommended off-midline procedures as preferred methods to close the wound.

Nevertheless, all three Guidelines are still hesitant to recommend off-midline procedures instead of open healing. The American Guideline advocates off-midline procedures "in the setting of complex and recurrent chronic pilonidal disease," whereas Italian Guideline suggests to perform off-midline surgery in "hirsute patients with extensive primary disease and deep natal clefts or with recurrent disease or unhealed midline wounds." Finally, the present German Guideline recommends Karydakis flap, Limberg flap, or Cleft lift when off-midline procedures are proposed; however, it still does not advocate their usage instead of open healing. Thus, some level of unease to recommend off-midline surgery in every patient undergoing excision of the pilonidal disease is still palpable

probably because of apparent difficulties to learn those techniques by most general surgeons.

Phenol treatment and fibrin glue are considered as reliable treatment options in patients with minimal disease in American and Italian Guideline, whereas both are clearly abandoned in German Guideline. There is extensive discussion on other techniques (Pit picking, Lord procedure, Gips technique, endoscopic surgery) in German Guideline and not quite as extensive in Italian. Surprisingly, American Guideline only considers endoscopic treatment as valuable minimally invasive procedure although the need for special experience and equipment are viewed as drawbacks. Despite those discrepancies, minimally invasive techniques are given full consideration as treatment option in patients with limited disease in all three publications.

All three Guidelines recommend paramedian incision in presence of acute abscess postponing definitive treatment after resolution of inflammation.

Postoperative shaving was considered as standard of pilonidal disease therapy for many decades. Shaving or laser depilation is proposed as primary treatment or as (postoperative) adjunct to other procedures by Italian and American authors but not by German although postoperative shaving is still very popular among German surgeons. Moreover, the present German Guideline warns on potentially increased recurrence risk when shaving is used postoperatively.

In conclusion, clear dynamics towards widespread use of minimally invasive techniques and off-midline procedures are recognizable in all international Guidelines. However, adherence to particular local traditions and principles of treatment incongruent with the new standards can still be clearly observed

Subject Recommendation Comment Asymptomatic disease No treatment necessary Unchanged to previous version Acute abscess Incision + drainage Unchanged to previous version Phenol treatment Favorable results. However, prohibited in Germany Unchanged to previous version Pit picking and similar procedures Should be used in minor primary disease. Lack of reliable long-term results Unchanged to previous version Sinusectomy Can be used in primary disease Unchanged to previous version Laying-open procedure No formal recommendation New in the Guideline Endoscopic treatment No formal recommendation New in the Guideline Laser treatment No formal recommendation New in the Guideline Excision + open wound healing Excision should stay as limited as possible. Main drawbacks are prolonged wound healing, time out of work and an increased recurrence rate as compared with off-midline procedures As compared with previous version, open healing is not named "standard procedure for treatment of pilonidal disease" anymore. Excision + marsupialization No formal recommendation Unchanged to previous version Midline closure Should not be used due to high incidence of wound dehiscence and an increased recurrence rate. Unchanged to previous version Z-plasty, V-Y plasty, Dufourmentel procedure Rarely used off-midline procedures play only a limited role in Germany. Thus, they cannot be recommended. Compared with previous version, rather dismissive recommendation Karydakakis flap Karydakakis flap should be considered as one of preferred off-midline procedures. Unchanged to previous version Cleft lift procedure Should be considered as one of preferred off-midline procedures. Main drawbacks of the procedure are difficulties to understand the marking and a trend towards an increased rate of wound complications. Unchanged to previous version except for somewhat more critical appraisal of difficulties to learn the procedure Limberg flap Should be considered as one of preferred off-midline procedures. The modified technique should be used instead of the original one. Unchanged to previous version Fibrin glue No formal recommendation New in the Guideline Autologous tissue treatment No formal recommendation New in the Guideline Postoperative drainage use Due to a lack of reliable evidence, a formal recommendation on postoperative subcutaneous drainages could not be given. Unchanged to previous version Prophylaxis of recurrent disease A formal recommendation on the use of postoperative laser depilation could not be given. Laser depilation could be considered individually as recurrence prophylaxis in young patients with a positive family history presenting with recurrent disease. New in the Guideline

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The authors declare that they have no conflict of interest.