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Research Article

Nigam's Classification of Pilonidal Sinus (NCP) – An Ideal Grading System for Pilonidal Sinus (PNS)

Vinod Kumar Nigam*, Siddharth Nigam

General and Minimal Access Surgery, Max Hospital, Gurugram, India

Abstract

Background: Pilonidal sinus is quite common in young hairy males. Inspite of it's common occurrence there is no universally accepted classification of pilonidal sinus. PNS is a known disease from the time of Sushruta 1600 BCE but no one thought about classifying it. *Objective:* We developed a classification of pilonidal sinus, Nigam's classification of pilonidal sinus (NCP), which is ideal for categorization of PNS and also guiding surgical treatment. NCP is based on anatomical, clinical and radiological (MRI) details. *Design:* Prospective Cohort design. Systemic reviews of existing literature about pilonidal sinus were done thoroughly. We considered existing limitations, gaps in diagnostic, therapeutic and prognostic value of existing classification of pilonidal sinus. *Settings:* The study primarily was done in Max Hospital, Gurgaon, Haryana, India. Out patient and radiology departments were mainly concerned. *Patients:* A total of 230 patients of chronic pilonidal sinus were studied between January 2001 to September 2026. Age, gender and BMI were recorded but not considered for exclusion. Patients of acute abscess with pilonidal sinus were not included in this study. *Intervention (s):* All patients were subjected to history taking, physical examination and MRI study. No probing or any other interventional process was done. *Main outcome measures:* NCP focuses on it's validity, reliability, clinical utility, and patient prognosis along with guidance to surgical treatment, NCP excels over existing classifications to pilonidal sinus in diagnostic and therapeutic decision-making. *Results:* In this study of 230 cases, 110 (48%) patients belonged to Type I of NCP and 120(52%) patients belonged to Type II of NCP. Most of patients were male, 208 (90.5%) between 21-30 years of age, 124 (53.9%). *Limitations:* Patients of acute abscess with PNS were not included in this study. *Conclusions:* Nigam's classification of pilonidal sinus is an ideal simple and result oriented classification with therapeutic decision-making guidance.

Keywords

Abscess, Chronic, MRI, Nigam's Classification, Pilonidal Sinus

1. Introduction

Pilonidal sinus (PNS) is a common and surgical problem among young adults. It is a disease having a tract or tunnel with free hairs and debris commonly found in natal cleft or crease of the buttocks near coccyx. PNS is most commonly found in natal cleft but other sites are also affected. Due to it's common site, the sacrococcygeal region, PNS usually means sacrococcygeal PNS. Pilonidal sinus usually develops in the sacrococcygeal area or other hair bearing area. It is not commonly found in umbilicus, head and neck, foot, breast and hand.

*Correspondence: Vinod Kumar Nigam (drnigamvk@gmail.com)

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In 1833 Herbert Mayo, British physiologist and surgeon described first in medical literature as a blind-ending sinus containing hair in the sacrococcygeal region in a young woman. [1] It was first officially described by Abraham Wendell Anderson (1804-1876) which dates back from 1847. [2] In 1847 Anderson AW reported an additional case of an ulcer containing hair and drained by him. In 1880 Richard Manning Hodges coined the term, 'pilonidal sinus' derived from the Latin words pilus (hair) and nidus (nest). [3] During World War II military truck and jeep drivers with prolonged sitting and bouncing friction used to develop PNS so it is also called "jeep drivers bottom" or "Jeep disease". Sushruta (600 BCE), ancient Indian surgeon, wrote in his legendary ancient book entitled "Sushruta Samhita" about PNS, correlated it with a condition called Shalyaja Nadi Vrana, (a tubular sinus tract cause by a foreign body, shalya). He identified Baala (hair) acting as a shalya (foreign body) as a primary root cause for this specific type of tract. He advised Kshara Sutra to management [4].

Pilonidal sinus if gets infected it develops certain clinical features like pain on sitting, redness & swelling at the site, foul odor pus or blood discharge at its opening. Hairs protruding from the opening. Fever due to infection is not common. It is estimated that pilonidal disease affects approximately 70,000 people in the United States annually. [5] Infected pilonidal disease affects approximately 0.7% of the population. [6] About half of patients present as acute emergencies with pilonidal abscess. Antibiotics should not be used as standalone therapy. [7].

Pilonidal sinus (PNS) and pilonidal sinus disease (PSD) are quite common in hairy young individuals. The incidence is commonly recorded as 26 per 1,00,000 people. [8] Furthermore the prevalence amongst men is two to three times of women. [9] About 80% of pilonidal sinuses occur in men, usually from the age of puberty to about 40 years of age, but rarely in older people. Women who develop a pilonidal sinus tend to be younger. This is consistent with their earlier onset of puberty.

It is observed by various workers globally that the incidence of PNS is increasing. However, studies from Germany have suggested an increase in PSD incidence based on data from military registries and inpatient settings. Using data from the German military registries, a study showed that the incidence rate of PSD increased from 0.3 per 1000 persons in 1985 to 2.4 per 1000 persons in 2007 [10].

1.1. Etiology of PNS

Exact cause of PNS is not known but it is believed that ingrown hairs with friction and infection are the real reasons for its etiology. It was earlier thought that PNS is a jeep drivers disease only, but later on found that anybody can suffer from it. According to NHS, the exact triggers is not fully clear, but it is widely thought to result from several combined factors: Loose hair penetrations as hairs from head and back, or surrounding skin fall into the cleft between the buttocks, friction and pressure by tight clothing and sitting push hairs deeper in skin, foreign body reaction to trapped hairs starts an immune response, and sinus tract formation happens due to continuous irritation, inflammation and infection and rupture of the collection cyst. It is found in nutshell that broken hairs get collected in natal cleft and the friction of buttocks during sitting, standing and walking creates shearing forces which push hairs through the moist and vulnerable skin in natal cleft.

1.2. Theories of Etiology of PNS

There are two theories of etiology of PNS

1.2.1. Congenital Theory

It was the main theory of causation of PNS before early 20th century. Early after its description, many clinicians considered the disease as congenital in origin, being derived from vestiges of medullary tube, dermoid traction, inclusion dermoid, or preen glands. [11] It was thought that PNS is caused by:

a. Flawed embryonic development or

b. Unclosed neural fold in the region of coccyx.

80 years ago, Gage reported that pilonidal cyst [12] and sinuses are congenital and he was supported. [13] Congenital theory of PNS was later on proved wrong.

1.2.2. The Acquired Theory

PNS occurs more often in young, hairy males who sit for long hours and are overweight and have deep natal cleft. Patey and Scarff observed pilonidal sinuses in the finger webs of barbers caused by customer's hair entering the skin and challenged the long-held belief that the disease was strictly congenital. [14] Entrapment of loose hair is important for causing PNS. Bascom J considered that this process triggers an inflammatory response, which may result in the development of cysts, sinuses or abscesses. [15] Karydakis simplified the description of the etiologic process citing three main factors – The hair or foreign body, a force causing deposition of hair into the sinus, and skin vulnerability. [16] Nigam VK etal developed their method of close operation for PNS, 'Nigam's Procedure for Pilonidal Sinus – A Zero Recurrence Technique' [17] in which they studied the factors responsible for recurrence i.e. leaving a part of PNS tract during surgery, infection of wound, postoperative hematoma at the surgery site, tension on suture line, dead space creation during surgery, lack of depilation around surgery site, and imperfect hemostasis during surgery. They concluded that concentrating on these factors with remedial approach reduces the recurrence after close method of surgery.

1.3. Pathology of Pilonidal Sinus

Pilonidal sinus is characterized by a tract containing loose hairs, debris and granulation tissue. Hairs may be isolated or connected with hair follicles. Interestingly, hair follicles are rarely seen on pathologic examination. [18] Pilonidal abscess, cyst and sinus are different terms but indicate towards one entity

and pilonidal sinus disease (PSD) term. The local cellular infiltration is sizable and often includes foreign body giant cells in association with hair. Fibrosis is seen at various sites in the sinus tract. If there is epithelial lining, it is usually not complete. A dense inflammatory reaction is often seen. Generally, clusters of hair shafts are seen embedded. A polymorphic infiltrate with plasma cells and lymphocytes are seen around embedded hairs. Pathology of pilonidal sinus may simulate that of hidradenitis suppurativa. Histological analysis shows granulomatous pseudo-cystic formation in the subcutaneous tissue of the sacrococcygeal region with contained hair debris [19].

1.4. Role of Imaging in PNS

The diagnosis of PNS is clinical and by detecting fistula or abscess formation at several regions. The diagnosis of PNS is generally made by history and physical examination but imaging plays its' role in complex and recurrent disease to mainly evaluate extent of disease and branches. Ultrasound for PNS is considered reasonable but both external ultrasound and endoanal ultrasound were found to be useful in evaluating the extent of pilonidal sinus disease and excluding perianal sepsis in a more recent study. MRI beats ultrasound by giving clearer and more detailed information about the extent of the disease and its branches.

MRI sinogram is performed similar to MRI fistulogram in pilonidal sinus to diagnose its type and identify hidden branches of the main tract and even deep-seated pilonidal abscesses. MRI's roles in pilonidal sinus are:

1) Preoperative surgical mapping – Preoperative mapping of PSD extensions is important.
2) Tract appearance
3) Identification of branches
4) Diagnosis of deep-seated abscess
5) Identifying inflammation
6) Evaluation of recurrence
7) Differentiates pilonidal sinus from anal fistula
8) Helps in classification of PNS
9) Differentiates between simple and complex PNS

1.5. Risk Factors of Pilonidal Sinus

PNS is a disease of young adult males. The risk factors of PNS are:

1) Male gender – Males are affected 2 to 4 times more often than females due to more hairs on a male body. PNS is commonly associated with young men. While the first woman patient with PSD was reported in 1880 by Hodges. [20] While some authors reported a 4: 1 male-to-female ratio.
2) Age – It is a disease of young adults, typically 15 to 30. It is rare after 40 years. It most commonly occurs after puberty due to changes in hormone levels affecting hairs and sweat glands. Pilonidal disease development is associated with puberty as the development of secondary six characteristics such as hair growth and oil production are thought to exacerbate pilonidal disease symptoms [21].
3) Genetic predisposition or familial tendency also plays a role in some cases. Jeffery L et al commended based on their work that genetic analysis of pilonidal sinus disease identified shared genetic architecture with hair biology and androgen-driven tracts [22].
4) Deep Natal Cleft – It helps in trapping hairs and bebris… with sweat making it vulnerable for PNS. Omer FA etal studied natal cleft depth in patients of pilonidal sinus and volunteers and concluded that 'The natal cleft of patients with pilonidal sinus disease is deeper than the natal cleft of members of volunteer group [23].
5) Type of body hairs – Thick, coarse and excessive body hairs make the body more prone to PNS. Bosche F etal studied hairs in pilonidal sinus and came to a conclusion that short hair fragments with rootless sharp cut ends enter the pilonidal cavity more easily than longer hair, [24].
6) Obesity – Higher BMI makes the natal cleft deep and increased friction. Obesity is linked with risk of developing pilonidal sinuses and its recurrence after surgery. Cubukcu A, etal found that, obese patients with high BMI have a higher risk of recurrence of pilonidal sinus disease after surgical intervention [25].
7) Prolonged sitting jobs like office sitting works and drivers are prone to PNS. Pilonidal sinus is common in jeep drivers as was found in World War II and it was related to prolonged sitting and sweat. Sitting for long hours on hard surface places continuous mechanical pressure on the natal cleft which pumps loose and coarse hairs into hair follicles.
8) Hyperhydria or excessive sweating makes the natal cleft moist most of the time and it is then vulnerable to hair penetration.
9) Tight clothing – Increase friction and sweating.
10) Poor hygiene – improper cleaning after defecation. The water cleaning is better than toilet paper cleaning.
11) Pilonidal sinus is common in certain individuals which have some risk factors such as: driver's job, hairy young men with deep gluteal cleft and family history of PNS. [26] Prolonged sitting jobs, obesity and driving more than 4-6 hours with less number of baths per week are considered risk factors for PNS. [27] Lifestyle factors, including a more sedentary lifestyle, smoking or an increase in body mass index have been proposed as part of the explanation as they are considered risk factors for developing PSD [28].

1.6. Nigam's Classification of Pilonidal Sinus (NCP)

Our classification, Nigam's classification of PNS is based

on its pathological features and MRI sinogram configurations. We purposely have not included pilonidal abscess to avoid confusion and complicated approach. Our classification also gives guidelines for treatment of PNS. However, there is lack of consensus on a classification system for the appearance of PSD. [29] Our classification makes this distribution without confusion simple, easy and clear. Radiological findings in pilonidal sinus (MRI sinogram) classify various varieties into just two groups and each group is further divided into three categories. The branching affects the categories of PNS which also helps in surgical treatment (excision) of the whole sinus tract including branches to avoid recurrence. If a part of main tract or part of a branch left unexcised then it can become the cause of recurrence after surgery. No branch or part of the branch must not be left during surgery.

We classified pilonidal sinus into following categories by keeping in mind the features of an ideal classification, simple, reproducible, clinically relevant, and capable of guiding treatment.

Type I (Primary Pilonidal Sinus, no scar present)

IA – Only a pit at sinus opening. *(Figure 1)*

IB – Only a straight snus tract without branches

IC – Sinus tract with branches or more than one tract

Type II (Secondary Pilonidal Sinus – Scar of previous surgery for PNS present or Recurrent PNS)

IIA – Only a pit at sinus opening

IIB – Only a straight sinus tract without branches

IIC – Sinus tract with branches

In Nigam's Classification of pilonidal sinus, we do not include abscess as we consider well-formed sinus or chronic disease only for classification. We did it to avoid confusion.

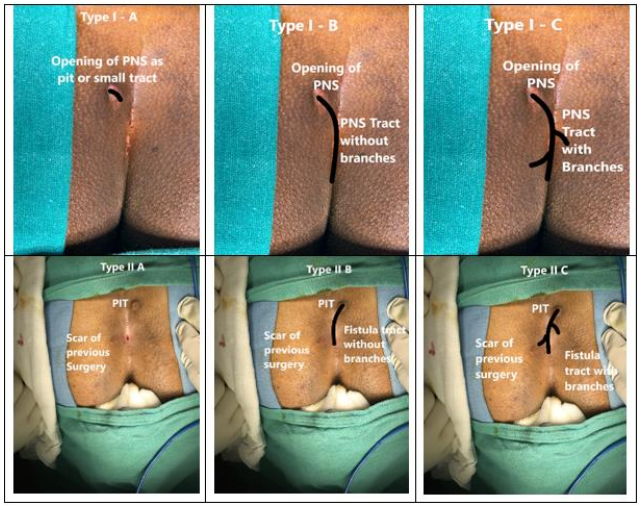


Figure 1. *Type I and Type II Pilonidal sinuses according to NCP.*

2. Materials and Methods

This study included 230 cases of chronic pilonidal sinus disease into Max Hospital and other hospitals of Gurgaon, Haryana, India, between January 2001 to September 2026. All patients were classified by Nigam's classification of pilonidal sinus. Patients of pilonidal abscess were not included in this study. All patients were operated by one and same team only. All patients were operated by same Nigam's procedure i.e. primary closure technique. No age was considered for exclusion. Demographics and history of previous PNS surgery were taken by all patients. Previous PNS surgery whether open or close was also recorded. MRI-sinogram was done as a routine procedure for all patients. All patients were divided between various types according to NPC, which also guided their surgical treatment.

Every patient signed the informed consent explaining their disease, procedure to be performed and probable complications. Appropriate antibiotics were given from the morning of the day of surgery.

3. Results

In our study, out of 230 cases of various types of pilonidal sinus maximum number of cases belonged to the type II-C, recurrent pilonidal sinus with branches. Branches were on one side (right or left), both sides (right and left), and superficial & deep. The least number of cases were of Type II-A, they were only represented as a pit. Cases belonging to Type I-B and Type I-C-combined shared majority of cases, 104 (45.20%). This study showed that 152 cases (66.10%) with branches were more than cases without branches, 70 cases (30.4%). Cases with branches were found more with secondary type or recurrent cases (Type II) than primary type. Whereas the cases without branches were more with primary pilonidal sinus Type I than secondary or recurrent pilonidal sinus or Type IA. Type IB primary type without branches were 50 (21.80%) as compared to secondary pilonidal sinus Type IIB without branches were 20 (8.60%).

Type IA and Type II A were treated with excision of the PNS and closure of the wound in single layer. Type IB, Type II B were completely excised after injecting methyline blue dye in the main tract confirming no branches. The surgery was Nigam's close method. Type IC and Type II C were treated by thorough inspection and search for branches and Nigam's close method repair was done after removing all branches and confirming that no branch was left. No methylene blue stained tissue was left un-excised.

4. Discussion

Classification for a surgical disease depends upon certain factors to make it ideal and these factors are that it should be simple, reproducible, clinically relevant, and capable of guiding treatment. Previous literature has outlined the prevalence of PSD [30] and evaluated surgical techniques [31] with use of a classification system, however, few studies exist evaluating the use of a classification system for PSD that informs the

choice of treatment. Symptoms are not considered for classification except discharge for sinus opening.

Unfortunately, there is no proper classification of this common ailment though people differentiated it into asymptomatic and symptomatic forms. Symptomatic disease includes acute pilonidal abscess and a symptomatic includes chronic pilonidal sinus. Complex or recurrent pilonidal disease is also included. Pilonidal sinus disease lacks a universally accepted, validated, reliable, and treatment related classification probably due to its wide and unpredictable spectrum of anatomical variations. Any human disease can be classified commonly by its etiology (infectious or communicable and noninfectious or noncommunicable), physiological basis, pathological features and duration of symptoms (acute and chronic). The most used and common classification in the World Health Organization is ICD (International Classification of Diseases).

The literature on pilonidal sinus disease (PD) can be criticized for the fact that many researchers make no attempt to classify or stratify the disease. [32] Erin M Beal, et al. published a systematic review in 2019 showing that no current classification system for pilonidal sinus disease is reliable or validated enough for routine clinical use. This highlights the need for an accessible classification system that will allow the informed choice of treatment. According to Beal EM etal there were eight classifications identified by his study of literature and most of these classifications were based on anatomical pathology. International Pilonidal Sinus Society (IPS) in 2017 in Berlin Proposed a classification [33] having four categories:

Type 1: Only midline pit or sinuses.

Type 2: Any midline disease with secondary sinus/es or abscess scar/s.

Type 3: Any midline disease with secondary disease extending below the tip of the coccyx.

Type 4: Any disease after treatment with definitive intent.

This classification has some negative points but the most important is that it has limited predictive validity in relation to post-treatment outcomes or long-term recurrence risks, different observers differently grade the same anatomical presentation. It leaves out demographics of patients along with risk factors.

Tazel gave a classification [34] divides PNS into 5 types: Type I – Asymptomatic pit 1 or more, without history of abscess formation, Type II – Acute pilonidal abscess, Type III – Pits with history of abscess drainage, Type IV – Extensive sinus disease, with 1 sinus opening lying outside natal cleft area, history of multiple abscess formation and Type V – Recurrent PD after any surgical treatment. Tazel classification is based on 'Navicular area' concept (region bounded by lateral edges of natal cleft and posterior border of anal triangle) and it has several negatives points as, vague boundaries of navicular area, obesity and gluteal mass vary from patient to patient and affect the boundaries of navicular area. Different surgeons may classify same PNS in Type III and Type IV as the anatomical borders are not fixed anatomical landmarks. It mixes acute and chronic types of disease. Complex or recurrent, Type V doesn't differentiate between minor or extensive disease.

Chavoin classification V divides PNS into two categories based on the pits or sinuses relative to the natal cleft, Type I – Primarily midline and/or laterae sinuses (pits or sinuses located in the midline or latera to the natal cleft). Type II – Recurrent disease process. Negative points of Chavoin classification are that it doesn't differentiate primary and recurrent disease into details or subgroups. It doesn't account details of pits and branches of main tract. It doesn't differentiate between minor and major problems (extensive disease). Excludes patient risk factors i.e. BMI, hair density and hair type. Doesn't deal with acute pilonidal abscesses.

Doll classification is a misnomer. It is based on anatomical severity and progression of pilonidal disease. It divides the PNS into 4 types: Type 1 – Only midline pits or sinuses with no tracking or lateral extensions. Type 2 – Midline disease with secondary lateral sinuses, acute abscesses, or scars from prior drainage. Type 3 – Any midline or secondary pilonidal disease that explicitly extends below the tip of coccyx (closure to the anus). Type 4 – Recurrent disease. [35] It has negative points: No Validation, Over simplification of Type 2 category (any midline disease with secondary sinuses or abscess scars), Excludes patient risk factors like BMI, hair density and hair type, and doesn't explains details of recurrent disease.

Irkorucu classification [36] of pilonidal sinus disease is created by Dr O-ktay Irkorucu based on anatomical and symptom based strategy. It classifies PSD into five types: Type I – Pits located in natal cleft. Type Ia – Asymptomatic with one or more pits and no prior history of abscesses.

Type Ib – Symptomatic and / or multiple pits along the cleft. Type II – Pits located off-midline

Type IIa - <2.5 cm from natal cleft. Type IIb - > 2.5 cm from natal cleft. Type III – Complex stages include extensive disease or recurrent disease. Negative points of Irkorucu classification of PNS are that it lacks spatial precision, Omits patient characteristics such as BMI, hair density, hair type. It excludes acute abscesses. It lacks global adoption only Turkish acceptance.

Guner A etal gave a staging system often called as Guner classification in which [37] he divided the PNS into following stages: Stage I: Single pit in the midline with no lateral extension. Stage II: Multiple pits in midline with no lateral extension. Stage IIA: 2-3 midline pits. Stage IIB: More than 3 midline pits. Stage III: Midline pits with lateral extension (sinus tract) in a single/unilateral direction. Stage IV: Midline pits with lateral extension (sinus tract) in both / bilateral direction. Stage R: Recurrent pilonidal sinus disease following any previous treatment. Guner's classification also advised stage-based treatment approach as: Pit-picker under local anesthesia for Stage a and stage IIA. Bascom cleft lift or modified cleft lift procedures for stage IIB and Stage III. Rhomboid excision combined with Limberg flap reconstruction. It is based on an anatomical and stage-based severity of chronic sacrococcyg-

eal pilonidal sinus disease. Negative points of Guner's classification of PNS are: It excludes acute abscesses. It doesn't consider patient demographics like obesity, type of hair and natal cleft depth which may affect results. It doesn't differentiate between asymptomatic pit and symptomatic pit. Recurrence category, Stage-R doesn't differentiate into substages. No multicentric validation. Some other classification like Karakas classification, Lapsekill and Awad classifications could not get validation and are not in much use at present.

Nigam's classification of pilonidal sinus is based on anatomical, pathological features and MRI sinogram findings along with guidance of treatment. It is a classification for chronic pilonidal sinus. It doesn't exclude any comorbidity except that diabetic patients should be treated for it to control it. NCP has following advantages which make it an ideal classification for PNS:

1) Easy and simple procedure.
2) Anatomical configuration of PNS tract is considered important.
3) Pathology – It's status – primary or secondary (recurrent).
4) Guidance for type of treatment.
5) Presence of pits doesn't decide stage as all pits are excised in Nigam's close procedure.
6) Short learning curve to decide the type of PNS quickly.
7) Most of surgeons recommend leaving acute abscess out of staging system to reduce complexity, so we did same. Presence of an abscess or need for drainage was included in two classification system reviewed whilst other dealt specifically with chronic disease. In NPC we deal with only chronic and well established PNS.
8) Presence of lateral branches on one side or both sides and at depth doesn't change the treatment in our method but reminds us only to remove branches completely to avoid recurrence.
9) It is straight forward classification dividing all cases clearly into two categories i.e. primary and secondary PNS, eliminating any confusion by counting pits and depth of natal cleft.
10) It doesn't depend on natal cleft and anal triangle which are having vague boundaries and are not fixed and clear anatomical landmarks. They only create confusion in the mind of young budding surgeons.
11) It doesn't depend on demographics of patient as the factors i.e. BMI, hair density and hair type does not change the treatment. Treatment advised by NCP is based on the category of the disease and not the type of patient and type of hairs as these factors are etiological factors.
12) NCP doesn't guide for flap or lift treatment rather than advices Nigam's close procedure.
13) NCP doesn't consider major and minor problem except it divides into types and ABC sub croups guiding treatment that can consider sinus tract with multiple branches as major or extensive disease but treatment advised is related to it.

The strength of Nigam's classification of pilonidal sinus is that it is based on anatomical, clinical and MRI based details making it an ideal classification of PNS.

The weakness of this study is that it excludes acute abscess and perianal sinuses caused by malignancy.

5. Conclusion

Pilonidal sinus is a common and chronic disease requiring surgery for cure. So far there is no ideal classification of PNS. We have given our classification, Nigam's Classification of Pilonidal Sinus (NCP) which is an ideal grading system for PNS. NCP barring categorizing pilonidal sinus also is a decision making for surgical treatment of PNS according to its types and subtypes. NCP may take sometime to be the universally followed classification of pilonidal sinus.

Abbreviations

BCE	Before Christ Era
BMI	Body Mass Index
ICD	International Classification of Diseases
IPS	International Pilonidal Sinus Society
MRI	Magnetic Resonance Imaging
NCP	Nigam's Classification of Pilonidal Sinus
NHS	National Health Service
PD	Pilonidal Sinus Disease
PNS	Pilonidal Sinus
PSD	Pilonidal Sinus Disease

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Author Contributions

Vinod Kumar Nigam: Conceptualization, Data curation, Methodology, Writing – original draft

Siddharth Nigam: Supervision, Validation, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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