

# A Case Of Perifolliculitis Capitis Abscedens Et Suffodiens Treated by Nanofire Needle Combined With 5-Aminolevulinic Acid Photodynamic

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## 1. Abstract

**1.1 Background:** Perifolliculitis capitis abscedens et suffodiens is a rare chronic suppurative skin disease of the head, most commonly seen in young men. It is a secondary inflammatory disease caused by hair follicles and sebaceous glands atresia. The pathogenesis is complex the treatment is various, and the treatment is difficult and easy to relapse. Chinese traditional nanofire needle combined with aminolevulinic acid photodynamic therapy is a new attempt to treat the disease, but the related methods are less reported.

**1.2 Clinical information:** The patient was an 18-year-old male. Two years ago, the patient developed scattered red inflammatory nodules and papules on the scalp without obvious cause or incentive. The rashes gradually increased and fused into nodules, some cysts. If we squeeze it, there is purulent discharge overflow and tenderness. In the past six months, it has gradually increased. The patient was once diagnosed with "perifolliculitis capitis abscedens et suffodiens" at a local hospital. But

the disease recurrent quickly, and the medicine therapy's effect was not well. We try to use the nanofire needle combined with 5-aminolevulinic acid photodynamic therapy. After six treatments once a week, the curative effect was noticeable, and the pigmentation disappeared within two months. After six months of follow-up, the lesions were almost cured without recurrence.

**1.3 Conclusions:** The nanofire needle combined with 5-aminolevulinic acid photodynamic therapy has a good curative effect in treating perifolliculitis capitis abscedens et suffodiens, which has the advantages of simple treatment, obvious effect, less pain, and so on. The two therapies are complementary, and the combined application has a better effect.

## 2. Keywords:

perifolliculitis capitis abscedens et suffodiens PCAS ; 5-aminolevulinic acid ALA photodynamic therapy PDT 5-aminolevulinic acid photodynamic therapy ; nanofire needle

## 3. Background

Perifolliculitis capitis abscedens et suffodiens is a rare purulent disease of chronic infection in the head skin. Various factors lead to hyperkeratosis of hair follicle sebaceous ducts and obstruction of ducts, resulting in the retention of sebaceous secretions. It can develop a secondary bacterial infection, inducing chronic recurrent scalp infection, abscess, sinus, and scar formation[1]. Many factors are related to the occurrence of the disease, such as oily skin, sex hormone level, smoking and hair follicle upgrowth, and abnormal keratosis of the scalp. Most pathogenic bacteria are staphylococcus aureus, and the treatment is multiple. The general treatment includes antibiotics, Isotretinoin, glucocorticoid, laser irradiation, adalimumab, and surgical incision and drainage. In addition, photodynamic therapy PDT is also a relatively new treatment for PCAS at present. PDT has phototoxicity and can selectively kill active proliferating cells, such as scalp fibroblasts and hyperkeratinized sebaceous ductal cells. PDT can inhibit scar hyperplasia and hyperkeratosis and has the effect of anti-inflammation and sterilization. It has been widely used to treat many diseases, such as skin tumors, viral infections, and acne[14]. The method of PDT is to externally apply 20% aminolevulinic acid hydrochloride powder solution (ALA), smear evenly on the surface of scalp lesions, and wrap it with plastic film and wet gauze. After avoiding light for 3-4 hours, irradiating in which the radiation wavelength is (630 ±5) nm, the energy density is 70mw / cm<sup>2</sup>, the local irradiation distance is 20 cm, and the radiation time is 20-30 min. It can be repeated regularly.

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The mechanism of action is that after ALA permeates into the tissue, it is easily selectively absorbed by the active proliferative tissue cells and transformed into protoporphyrin accumulated in cells. After being stimulated by specific wavelength light, it was converted into cytotoxic substances to cause cell necrosis and apoptosis, consequently inhibiting the secretion of hair follicle sebaceous gland cells, hyperkeratosis of sebaceous duct cells, hyperplasia of fibroblasts, excessive infiltration of inflammatory cells, and it kills pathogens in hair follicles, which has a therapeutic effect on the disease[9]. An important research area is how to improve the penetration of ALA into the skin and subcutaneous tissue to improve the effect of photodynamic therapy. In a patient with PCAS, we used multi-point nanofire needle puncture followed by ALA photodynamic therapy, which was conducive to better penetration of ALA into the skin and subcutaneous tissue, resulting in a better therapeutic effect. At the same time, puncturing the local lesion site with a multi-point nanofire needle is beneficial not only to the subcutaneous infiltration of ALA drugs but also to the exudation and drainage of subcutaneous edematous exudate and pus. Compared with simple ALA photodynamic therapy, it can produce better efficacy. Referring to the literature [10], similar treatments are rare. So we introduce this as follows.

## 4. Case presentation

### 4.1. Clinical information

The patient is a male 18 years old, with recurrent papules, nodules and cysts on the head with pain for two years, aggravated for six months. The patient had scattered red inflammatory nodules and papules on his scalp for no apparent reason or triggered two years ago. The rashes gradually grew, increased in size, and fused into nodules, some of which were cysts, with purulent discharge on squeezing and pressure pain (Figure 1). The patient was diagnosed with “perifolliculitis capitis abscedens et suffodiens” at a local hospital. Moreover, he was given medication such as isotretinoin, but the rash improved and then recurred. In the past six months, the inflammation has been recurring, and the patient was given oral medication such as “Chuan Wang Anti-inflammatory Tablets”, “Azithromycin Capsules”, and “Isotretinoin Pills”, but the results were still not good. The patient came to our department for further treatment, and we tried nanofire needle acupuncture combined with 5-aminolevulinic acid photodynamic therapy. The patient was in good health, with no history of hypertension or diabetes, tumors, infectious diseases such as hepatitis or tuberculosis, and no history of trauma or surgery. Physical examination: general condition, no significant abnormalities on systemic examination, no enlargement of systemic lymph nodes, no abnormalities on cardiopulmonary or abdominal examination. Dermatological examination: Hemispherical and banded red nodular changes can be seen on the scalp of the head top and occipital part, pained and hardened. There are dark red cysts of different sizes in some regions, and more purulent secretions can be seen by squeezing slightly, and the hair in some areas is sparse. Laboratory tests, including routine blood tests, C-reactive protein, routine urine tests, routine stool tests, liver and kidney function tests, and coagulation function tests, had no significant abnormalities. Syphilis serology test

and HIV antibody were negative; Abdominal ultrasound check had no significant abnormality; Spores and mycelium were not found in immunofluorescence staining test; No cardiopulmonary abnormalities were found in chest CT Scanning; Tumour-associated antigens were negative. Skin pathology showed hair follicle plug formation, hair follicle atresia, granulomatous reaction, and keratin could be found in the abscess. The diagnosis was perifolliculitis capitis abscedens et suffodiens.

### 4.2. Treatment:

The patient is placed in a quiet and comfortable position, and the skin of the head is routinely disinfected locally with Anl iodine. Hold the alcohol lamp in your left hand, and light it as close to the lesion as possible. Hold a disposable sterile acupuncture needle with a diameter of 0.4mm in the right hand, place the needle body in the middle and upper part of the flame, heat the needle body and needle tip, burn the needle until it turns white, use wrist force to stab the skin lesion steadily, accurately and quickly, and then promptly remove the needle. Multiple punctures were performed, with an average area of 1 needle per centimeter, followed by extrusion and clearance of the exudate and pus at the site of the hair follicle (Figure 2). Then, the 20% aminolevulinic acid hydrochloride powder solution, which was dissolved in the dark, was applied to the surface of the scalp lesion and the surrounding area within 1 cm and wrapped with plastic film and wet gauze. After 3-4h of light avoidance, the head was irradiated with red light using the AIA-PDT device for 20-30 minutes. The radiation dose was determined according to the lesion site, the lesion response, and the tolerable energy of the patient and was adjusted appropriately. The treatment was performed once a week for a total of 6 times.

### 5. Results:

The patient's rash was nearly resolved after six sessions of nanofire needle pretreatment combined with 5-aminolevulinic acid photodynamic therapy, and now, the follow-up has been continued for half a year. The patient's hyperpigmentation disappeared, and the skin returned to standard color within two months of treatment (Figures 3-4).

### 6. Discussion and conclusions

Perifolliculitis capitis abscedens et suffodiens, also called perifollicular inflammation of the scalp, is a chronic purulent skin disease rarely seen clinically, most often in young men. It is a secondary inflammatory disease caused by hyperkeratosis and atresia of the follicular sebaceous duct. It is often accompanied by coalescent acne and suppurative hidradenitis, and the pathogenesis and histopathology of these three diseases are very similar. Therefore, some refer to these three diseases as a triad of follicular atresia [1]. The aetiology of follicular atresia is currently unknown. The pathogenesis is complex, treatment is difficult, and the disease has an easy recurrence. Most treatments are taking oral antibiotics plus glucocorticoids, glucocorticoid injections into the lesion, or taking Isotretinoin orally. Surgical incision and drainage plus add plastic sutures, laser, and other comprehensive treatments can

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also use to treat it. However, they are still prone to recurrence[2,3,13]. Pathology often suggests follicular orifice keratosis, follicular atresia with granulomatous reaction, and keratinized material found within the abscess. PCAS has been a problematic skin condition to treat clinically. The initial clinical symptoms of the disease are papules and pustules. With the progression of the disease, dense abscesses and nodules can be formed, leading to erosion of the skin lesions. In severe cases, the nodules increased markedly, often accompanied by tissue scars and hair loss on the surface of the nodules. It has been reported [4] that doxycycline combined with 10% 5-aminolevulinic acid photodynamic therapy has obvious early efficacy and definite long-term efficacy in treating PCAS. PCAS is persistent, refractory and prone to relapse. The course of disease can last for years or even decades, which seriously affects people's appearance and physical or mental health. Therefore, using safe and effective methods to treat PCAS has become the focus of clinical research [5]. In the expert consensus on the clinical application of aminolevulinic acid photodynamic therapy (2015), there are many reports in the literature which show that ALA-PDT has a good effect on PCAS [6-7]. In photodynamic therapy, the photosensitizer ALA is soaked into the human tissue, which is easily absorbed by the proliferative active tissue cells and converted into protoporphyrin, mainly protoporphyrin IX. After this, the diseased tissue is irradiated with a specific wavelength and protoporphyrin IX is activated under the irradiation of a specific wavelength excitation light source. The absorption light energy is transferred to the surrounding oxygen molecules. It can generate reactive oxygen species such as singlet oxygen and oxygen free radicals, which can kill active proliferating cells, inhibit bacteria, keratinization, and proliferation of hair follicle cells, fibroblast proliferation, and local inflammatory response, and exert photodynamic therapy effects [8,9].

Nanofire needle, also called "burning acupuncture". It is a disposable sterile acupuncture needle placed in the upper part of the flame, heating the body of the needle first and then the tip of the needle, burning the needle until it turns white, and then using the wrist force to stick straight into the skin lesion steadily, accurately and fast. It can pierce the lesion at multiple points, playing the functions of sterilization, hemostasis, and smooth drainage. It also can facilitate the external application of drugs to infiltrate the skin, regulate local immunity, etc. It is an ancient Chinese medical method that can be used to treat various diseases [10]. Compared to traditional fire needling, nanofire needling has a thinner diameter, which is less painful for the patient and reduces the patient's psychological fear. It has the advantages of traditional fire needling [11,12]. Combining nanofire needling and photodynamic therapy improves drug penetration (ALA) into the skin tissue and produces better therapeutic results. In conclusion, nanofire needle combined with 5-aminolevulinic acid photodynamic in the treatment of PCAS can improve the efficacy of photodynamic therapy. It can improve the condition of skin lesions and the quality of People's life, with good safety, high patient satisfaction, mild pain, and low psychological fear. Therefore, we believe that this method is worthy of clinical application.

Fig 1. The patient with perifolliculitis capitis abscedens et suffodiens PCAS. There are dark red cysts of different sizes in some regions, and more purulent secretions can be seen by squeezing slightly, and the hair in some areas is sparse. Fig 2. After treatment of nanofire needle.



**Figure 1:**

**Figure 2:**

Fig 3. The patient's hyperpigmentation disappeared, and the skin returned to standard color within two months of treatment. Fig 4. The appearance of the head at six months of follow-up after treatment, the lesions were basically healed.



**Figure 2:**

**Figure 2:**

## 7. Abbreviations

PCAS: Perifolliculitis capitis abscedens et suffodiens; ALA: 5-aminolevulinic acid ; PDT photodynamic therapy.

## Author contributions

Conceptualization: HW and JL; writing-original draft preparation: HW ; data collection and analysis: HW, ZX, HL and JC; writing-review and editing: HW; funding acquisition: HW . All authors read and approved the final manuscript.

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