Histopathological evidence of efficacy of microneedle radiofrequency for treatment of axillary hyperhidrosis

Sir,

A major concern about the treatment of hyperhidrosis is the lack of clinical guidelines. Many medical (e.g. Botulinum toxin type A) and surgical methods have been used to overcome excessive sweating with variable results.[1] Energy-based devices have recently gained increasing acceptance for the treatment of many skin disorders and cosmetic conditions including facial rhytides and skin laxity.[2,3] Recently, some researchers clinically evaluated the use of radiofrequency (RF) energy in the treatment of primary axillary hyperhidrosis (PAH), which suggest that the bipolar radiofrequency devices are effective in reducing the amount of sweating,[4-6] but very limited published data on histological confirmation of successful treatment is available.

We report the successful treatment of a 25 year old man with refractory primary axillary hyperhidrosis with fractionated microneedle radiofrequency (FMR). Topical treatment with aluminum chloride had been ineffective and the patient had discontinued it 6 months ago. He had received multiple sessions of botulinum toxin injections in the area, the last injection being 4 years ago. Systemic treatment with anticholinergic agents had to be stopped due to severe adverse effects.

The patient underwent four treatment sessions of fractionated microneedle radiofrequency FMR (INFINI; Lutronic, Goyang, Korea) at 2-week intervals. Pre-treatment results of the iodine–starch test are illustrated in Figure 1.

The procedure was performed in four steps. Step 1: Sizing of the area to be treated and marking that area after starch–iodine test. Step 2: Topical anesthesia under occlusion. Step 3: Placement of hand piece on designated areas to deliver the therapy. Step 4: Dressing with sterile vaseline gauze.

The following settings were used: microneedle penetrating depth of 2.5- to 3-mm, level strength of 6 to 9, and RF time of 140- to 180-ms.

The biopsy sample taken 30 days post-treatment showed reduction in the number and size of both apocrine and eccrine glands after treatment [Figure 2]. The density of sweat glands per low power field at base line and 30 days post-treatment was approximately 66 and 40, respectively. A mild lympho-histiocytic infiltrate, peri-glandular fibrosis, and neovascularization were identified surrounding the atrophic glands, suggestive of post-traumatic reactive changes. Coagulation changes of the glands (eosinophilic body) due to thermolysis is depicted in Figure 3.

The only adverse effects observed were erythema and pin point bleeding in the immediate post-procedure period [Figure 4].

The results of the iodine–starch test at the end of treatment are shown in Figure 5. During the 6-month follow-up, the patient had no recurrence.

Fractionated microneedle radiofrequency is a minimally invasive method that utilizes microwave energy to heat

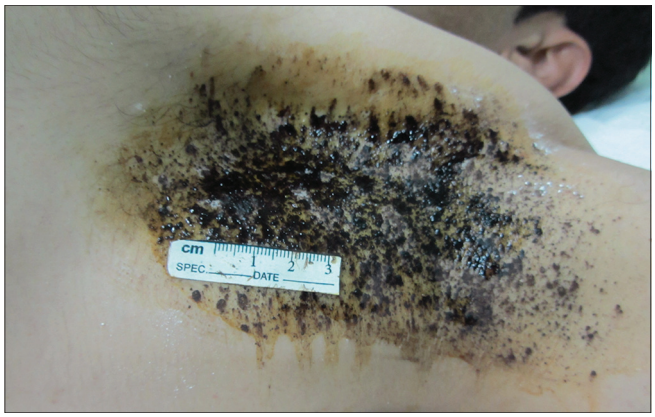

Figure 1: Starch–iodine test. Starch–iodine photographs of the left axilla of subject at baseline (blue-black sedimentation)

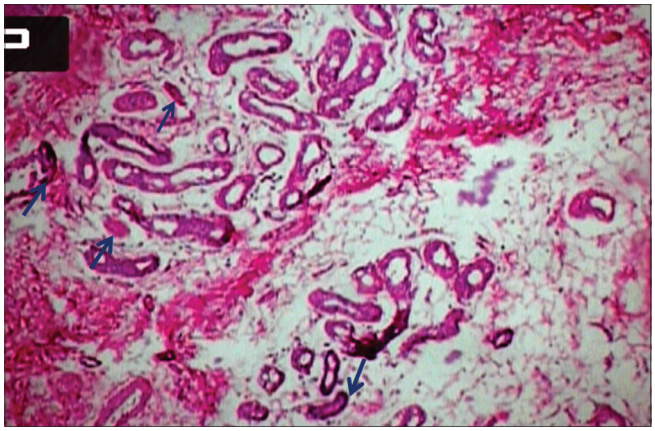

Figure 3: Coagulation changes of the glands due to thermolysis (arrow) (Hematoxylin and eosin, ×100)

Figure 5: Starch–iodine test. Normal results of starch–iodine test after four sessions of fractionated microneedle radiofrequency,(White sedimentation)

the target tissue without destroying the epidermis, by using rapid penetration with microneedle.[7,8]

The radiofrequency energy from the tip of the microneedles causes direct thermal injury at the

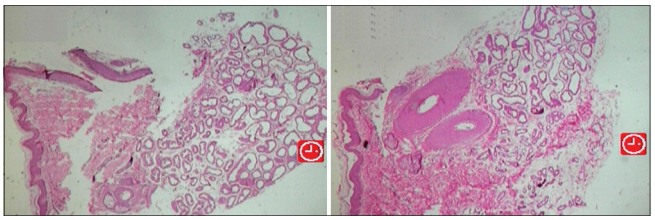

Figure 2: Baseline biopsy of sweat glands (Right) and the posttreatment appearance of sweat glands (left) which show decrease in the number and size of both apocrine and eccrine glands after treatment. (Hematoxylin and eosin, ×40)

Figure 4: Erythema and pin point bleeding after FMR

interface between deep dermis and subcutis, which results in thermolysis and decrease in the size and density of the apocrine glands,[9] while minimizing damage to surrounding tissue.

Johnson *et al.*, studied the microwave thermolysis of sweat glands and demonstrated that microwave technology is well suited for targeting sweat glands while allowing for protection of both the upper skin layers and the structures beneath the subcutaneous fat. They demonstrated gross pathological and histological response with generation of thermally affected zones in the desired target region while providing protection to the upper skin layers.[10]

Kushikata *et al.*, in serial skin biopsy samples taken post-treatment, showed progressively, necrosis of sweat glands, reduction of viable sweat gland structures, and peri-glandular fibrosis, suggestive of post-traumatic reactive changes.[11]

Our patients showed similar histologic findings of destruction of eccrine and apocrine glands and associated cell necrosis that localized at the junction of deep dermis and subcutaneous tissue.

A clear decrease of viable sweat gland structures was seen compared to baseline sample with a sparse inflammatory infiltrate.[5,10,12]

Even though fractionated microneedle radiofrequency can be used as an effective, harmless, and nonaggressive method for treatment of primary axillary hyperhidrosis, further studies are needed to confirm and clearly define the histopathological changes induced in the skin by radiofrequency.

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Farahnaz Fatemi Naeini, Ali Saffaei[1], Mohsen Pourazizi[2], Bahareh Abtahi-Naeini

Skin Diseases and Leishmaniasis Research Center, Department of Dermatology. [1]Department of Clinical and Pharmacy Practice Pharmacy Students' Research Committee, Department of Clinical Pharmacy and Pharmacy Practice, School of Pharmacy, Isfahan University of Medical sciences, Isfahan, [2]Students' Research Committee, Department of Dermatology, Semnan University of Medical Sciences, Semnan, Iran

Address for correspondence: Dr. Bahareh Abtahi-Naeini, Skin Diseases and Leishmaniasis Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: Bahareh.abtahi@yahoo.com

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