Porocarcinoma; presentation and management, a meta-analysis of 453 cases

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HIGHLIGHTS

- Porocarcinoma is a rare sort of skin cancer developing from sweat glands.
- Because of rarity of the problem, there is controversy regarding both presentation and management.
- The aim of the current meta-analysis is to summarize all data regarding the disease.

ABSTRACT

Background: porocarcinoma is a rare sort of skin cancer developing from sweat glands. Its clinical course and management are not well understood.

Objectives: the current meta-analysis is to address the presentation and management of porocarcinoma.

Data sources: Web of Science, PubMed, MEDLINE on OVID and Google scholar were searched for English-language studies published before December 1, 2016.

Results: The review of literature revealed 453 cases. From which 222 (49%) cases were male and female were 231 (51%). The mean age was 67.57 years. The mean duration of presentation was 5.57 years ranging from 4 days to 60 years of age. The most common site of affection is the head and neck (39.9%) followed by lower extremity (33.9%). Mass and nodule are the most common modes of presentation. Metastasis occurred at presentation in 110 (31%) cases. The most common organ to which porocarcinoma metastizes is the nearby lymph node (57.7%).

Conclusions: Porocarcinoma is an aggressive skin cancer. Surgery is the main modality of treatment.

Systematic review registration number: reviewregistry233.

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1. Introduction

Porocarcinoma is a rare sort of skin cancer developing from sweat glands, specifically, it is a malignancy of the eccrine sweat glands [1]. Its etiology is not well understood. However, some studies have showed that the tumor developed from a pre-existing eccrine poroma. From others perspective, chronic light exposure, exposure to chemical agents and immunosuppression could be the predisposing factors for de novo eccrine porocarcinoma [2]. Porocarcinoma is a dangerous disease because of high rate of recurrence after resection and metastasis to vital organs [3,4]. Because of rarity of the problem, there is controversy regarding both presentation and management [5,6]. Lloyd et al. revealed features like a rapid increase in size, foul odor and fungating fleshy appearance while Kurashige and colleagues who collects 8 cases revealed that all cases of porocarcinoma presented with erosive reddish nodules [6,7].

Controversy regarding treatment is also present [8]. Kurashige and colleagues who present 8 cases of porocarcinoma summarized that surgical resection should be done in all cases, as adjuvant therapy in form of local irradiation, while Fujimura et al. preferred surgical resection of the mass and giving adjuvant therapy only in special situation [7]. The aim of the current meta-analysis is to summarize all data regarding the presentation and management of cases with porocarcinoma which was done in line with PRISMA guide line [9].

2. Methodology

Information sources and Search: Web of Science, PubMed, MEDLINE on OVID and Google scholar were searched for English-language studies published before December 1, 2016. The search key words were porocarcinoma, carcinoma of sweat gland and tumor of sweat gland. The data collection was supplemented by references cited by included articles.

Eligibility criteria: For a study to be included in this meta-analysis, it should address at least one specific aim (clinical course, management, or both) of porocarcinoma (Fig. 1).

Data collection process: Data were taken directly from the articles by 4 authors independently. Investigators have not been contacted to obtain and confirm the data.

Data items: Several data were extracted and pooled from all included articles. Those articles were socio-demographic characteristics of the patients, sample size, presentations, duration of presentation, method of diagnosis, options for management, recurrence rate and complications.

Summary measures and Synthesis of results: Extracted data were calculated and re-analyzed totally. According to the variables, they are showed as percentage, mean values, and ranges of variation and percentages. The search in the medical literature revealed 104 studies which included 453 patients.

3. Result

The result reveals 453 patients. From which 222 (49%) case were male and female were 231 (51%). The mean age was 67.57 years ranging from 6 months to 97 years of age. The mean duration of presentation was 5.57 years ranging from 4 days to 60 years. The most common sites of affection are the head and neck (39.9%) followed by lower extremity (33.9%). Table 1 shows the distribution of the patients according to the site of affection. Mass and nodule are the most common modes of presentation. Table 2 shows presentation of the porocarcinoma with their frequency of appearance. Metastasis occurred at presentation in 110 (31%) cases. The most common organs to which porocarcinoma metastasize are the nearby lymph nodes (57.7%), followed by lung (12.8%). Table 3 shows the organs of metastasis.

4. Discussion

Based on their findings, some authors stated that porocarcinoma is more common among male patients [7,26]. The current metadata showed that porocarcinoma is evenly distributed according to the gender, both male and female are equally affected, (male 49% is nearly the same female 51%). The mean age of presentation is seventh and eighth decades of life (mean age 67.57 years, ranging from 7 months to 97 years) [34]. Most of the patients present with mass without symptoms (poroma) long time before converting to malignant type (porocarcinoma) [8,62]. According to this study, the mean duration of presentation was 5.73 years. Robson and colleagues reported a case of porocarcinoma presented with history of 60 years of benign stable mass [30]. This finding may suggest that aggressive management of benign subcutaneous mass is advised to prevent malignant conversion especially when the diagnosis is not confirmed to be benign. The literature showed that most of the cases of porocarcinoma present with either nodule or mass [31]. The current meta-data also confirmed this finding and about 71.2% cases presented with either nodule or mass. Yamamoto and associates reported that majority of porocarcinoma lesions appear in the upper extremity (80%) while Shiohara and colleagues revealed the reverse of this finding. In their 12 case series, they reported that in 9 (75%) cases of them, the primary site was the
lower extremity [30,103]. Domere et al. stated that the most common primary sites for porocarcinoma are head and neck [28]. The result of this review confirmed the latter claim and found that in (39.9%) of the patients the primary sites were head and neck, followed by lower extremity (33.9%). The risk factors for developing porocarcinoma are not well understood. Several authors reported that their patients were in immune-compromised state. Some of them had history of immunosuppressive therapy and others decreased immunity from diseases [21,26,29]. Belin et al. studied two patients with porocarcinoma who received immunosuppressive medications, one for renal transplantation, and another for chronic lymphoid leukemia [26]. Mahomed and associates reported 5 cases of porocarcinoma with history of immune-compromised conditions, three of them were recipients of renal transplant and other two cases were the victims of acquired immune deficiency syndrome (AIDS) [29]. Owing to occurrence most commonly in sun exposed area (head, neck, hand, leg), some authors concluded that exposure to sun light is another risk factor [3,5,7,10,24]. In almost all cases, tissue biopsy was necessary for diagnosis in form of

**Table 1**
Distribution of the patients according to the site of presentation.

| Site           | Number (%) | References                  |
|----------------|------------|-----------------------------|
| Head and neck  | 140 (39.9) | [3,5,7,8,10–45]             |
| Lower extremity| 119 (33.9) | [8,46–62]                   |
| Upper extremity| 31 (88)    | [1,8,63–76]                 |
| Back           | 18 (5.1)   | [8,77–84]                   |
| Chest wall     | 16 (4.6)   | [85–88]                     |
| Genitalia      | 14 (4)     | [8,89–95]                   |
| Abdomen        | 9 (2.6)    | [8,96–101]                  |
| Perianal        | 2 (0.6)    | [10,103]                    |

**Table 2**
The most common presentations of porocarcinoma.

| Presentation | Number/Total | percentage |
|--------------|--------------|------------|
| Mass and nodules | 109/153     | 71.2       |
| Ulcer        | 28/153       | 18.3       |
| Plaque       | 15/153       | 9.8        |
| Swelling     | 2/153        | 1.3        |
| Wart         | 1/153        | 0.6        |
| Papule       | 1/153        | 0.6        |
| Nevus        | 1/153        | 0.6        |

**Table 3**
The frequency of the organs to which porocarcinoma mostly metastasize.

| Site            | Number/total | Percentage |
|-----------------|--------------|------------|
| Lymph nodes     | 90/156       | 57.7       |
| Lung            | 20/156       | 12.8       |
| Liver           | 14/156       | 9          |
| Brain           | 14/156       | 9          |
| Cutaneous       | 9/156        | 5.8        |
| Bone            | 5/156        | 3.2        |
| Breast          | 1/156        | 0.6        |
| Stomach         | 1/156        | 0.6        |
| Disseminated    | 2/156        | 1.3        |
excisional, incisional and punch biopsy [21,29]. In the literature, several histological features and subtype mentioned. These includes; ductal differentiation, nests of basoloid cells, squamoid tumor cells, infiltrative spinal cells, cells of anacanthic epidermis, Borst Jadassson appearance, ulcerated epithelial tumor, Bowenoid porocarcinoma, nests of small atypical cells, clear-cell, high infiltrative pattern and hyperchromatic nuclear [7,13,26,62,72,102,103]. Surgery was the main mode of therapy with adjuvant chemoradiotherapy if metastasis and/or recurrence occurred [50,82–104]. Metastasis was found in 110 (31%) cases [3,10,63,65,68,73,76,86]. High rate of metastasis showed by this data reflects the real picture or due to the fact that physicians who encountered metastatic porocarcinoma are more likely to report their cases than the ones who did not encounter metastases is not known. The most common organs of metastasis are the regional lymph nodes (57.7%) [10,63,65,73]. Although regional lymph node dissection was not performed routinely, high rate of metastasis to regional lymph nodes revealed by these meta-data may necessitate regional lymph node dissection. In spite of that there are no enough data to support routine lymph node dissection. Although most of the case series and case report did not mention the follow up and survival rate of the patient accurately, it can be seen in some report that porocarcinoma is very aggressive malignancy and kills the patient few months after the diagnosis regardless of the sort of management [67–69,72,95]. There are several limitations for study, first: the condition is rare. Second. The included papers were of different types. Third. Some of the papers did not report necessary data. Fourth. Some papers were so old that cannot be retrieved completely.

In conclusion, porocarcinoma presents with mass and nodule and affect head and neck in most of the cases. Tissue biopsy is the main method of diagnosis. It may develop from the benign counterpart (poroma) which may present several years before. It commonly metastasizes to lymph nodes. Wide local excision and regional lymph node dissection are advised. Chemotherapy and radiotherapy are necessary when presented with metastasis and recurrence.

Ethical approval

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Author contribution

Abdulwahid M. Salih, F.H. Kakamad, Hiwa O. Baba: substantial contribution of the concept and design, drafting the manuscript and final approval of the manuscript. Rawezh Q.Salih, Hawbash M.R, Shvan H. Mohammed, Snur Othman: substantial contribution of the concept and design, acquisition of the data, final approval.

Yadgar A. Saeed, Imad J. Habibullah, Aso S. Muhialdeen, Rebaz O. Nawroly, Zhahir D. Hammoor, Nawashirwan H. Abdulkarim: substantial contribution of the concept and design, analysis of data, drafting the manuscript, final approval of the data.

Conflicts of interest

None.

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References

[1] N.R. Devi, K. Valarmathi, M. Lilly, S. Satish, N. Mishra, Primary axillary porocarcinoma: a rare cutaneous tumour, J. Clin. Diagn. Res. 10 (2) (2016) 4–6.
[2] Murilo de Almeda Luz, Daniel Cury Ogata, Leandro Carvalho Ribeiro, Eccrine porocarcinoma (malignant Eccrine poroma), Clin. (Spaio Paolo) 65 (7) (2010) 735–742.
[3] Youssef H. Zeidan, A. Jason Zauls, Anand K. Sharma, Treatment of Eccrine porocarcinoma with metastasis to parotid gland, J. Med. Case Rep. 4 (2010) 147.
[4] Takı Fujimura, Akira Hashimoto, Setsuya Aiba, Successful treatment of eccrine porocarcinoma, Case Rep. Dermatol. 6 (2) (2014) 159–163.
[5] Smait Surendra Masamatti, Vijaya Chowdappa, Eccrine porocarcinoma of scalp, J. Clin. Diagn. Res. Ser. online) 1 (1) (2016) 1–16.
[6] Mark Sheldon Lloyd, Nguib El-Muttersd, Arobi, Can. J. Plast. Surg. 11 (3) (2003) 153–156.
[7] Y. Kurashige, T. Minemura, T. Nagatani, Eccrine porocarcinoma: clinical and pathological report of eight cases, Case Rep. Dermatol. 5 (3) (2013) 259–266.
[8] A.H. Mehregan, K. Hashimoto, H. Rahbari, Eccrine adenoscarcinoma: a clinical and pathological case study of 35 cases, Archiv. Dermatol. 119 (2) (1983) 104–114.
[9] David Moher, Alessandro Liberati, Jennifer Tetzlaff, Douglas G. Altman, The PRISMA Group. Preferred reporting items for systematic reviews and metaanalyses: the PRISMA statement. Int. J. Surg. 8 (2010) 336–341.
[10] M.N. Ahmed, M.M. Kumar, S.M. Ahmed, N.V. Reddy, Eccrine porocarcinoma of scalp with multiple secondaries arising after radiotherapy for hypopharyngeal carcinoma, J. Ecol. Med. Dent. Sci. 3 (2014) 7574–7578.
[11] P.A. Gerber, K.W. Schulte, T. Russick, D. Bruch-Gerharz, Eccrine porocarcinoma of the head: an important differential diagnosis in the elderly patient, Dermatology 216 (3) (2008) 229–233.
[12] T. Klentner, I. Apakakis, G. Kayser, C.C. Boederker, Eccrine porocarcinoma of the ear mimicking basaloid squamous cell carcinoma, Otolaryngol. Head Neck Surg. 135 (1) (2006) 158–160.
[13] B.S. Bleier, J.G. Newman, H. Quon, M.D. Feldman, K.K. Kent, G.S. Weinstein, Eccrine porocarcinoma of multiple secondary arising after radiotherapy for hypopharyngeal carcinoma, J. Ecol. Med. Dent. Sci. 3 (2014) 7574–7578.
[14] P. Ciesielski, B. Gornicka, K. Gornicka, M. Kozlowszcwczak, P. Siekierski, Neck sweat gland cancer hemorrhage. Case study, Contempt Oncol. Pozn. 17 (2013) 100–102.
[15] S.S. Masamatti, A. Narasimha, A. Bhat, V. Chowdappa, Eccrine porocarcinoma of the scalp: a rare case report with review of literature, J. Clin. Diagn. Res. 10 (1) (2016) 15–16.
[16] J.P. Phukan, S. Sengupta, A. Sinha, Eccrine porocarcinoma of scalp: a rare case report, Iran. J. Pathol. 10 (1) (2015) 65–68.
[17] H.S. Permi, S.P. Bhat, H.L.K. Prasad, V.S. Bhat, Eccrine porocarcinoma of scalp: an uncommon tumor at an unusual site, Indian J. Surg. Oncol. 2 (2) (2011) 145–147.
[18] R.E. Rana, S.S. Verma, V.A. Puri, A.S. Baliahsing, Sweat gland tumor (Eccrine Porocarcinoma) of scalp: a rare tumor, Indian J. Plastic Surg. 38 (1) (2005) 51–53.
[19] H. Jeon, C. Smart, An unusual case of porocarcinoma arising on the scalp of a 22-Year-old woman, Am. J. Dermatopathol. 37 (3) (2015) 237–239.
[20] W. Melgandi, R. Benson, A. Hakin, S. Bhasker, Porocarcinoma scalp with high risk features treated with surgery and adjuvant radiotherapy: a case report and review of literature, J. Egypt. Natl. Cancer Inst. 28 (3) (2016) 195–198.
[21] Y. Kim, R.A. Scolyer, E.M. Chia, D. Steven, R. Ghahrial, Eccrine porocarcinoma of the upper eyelid, Australas. J. Dermatol. 46 (4) (2005) 278–281.
[22] Y.H. Zeidan, A.J. Zauls, M. Biele, E.J. Lentsch, A.K. Sharma, Treatment of eccrine porocarcinoma with metastasis to the parotid gland using intensity-modulated radiation therapy: a case report, J. Med. Case Rep. 4 (1) (2010) 147.
[23] S.T. Mak, K.K. Li, Eccrineporocarcinoma of the eyelid in a Non-Caucasion patient, Ophthalmic Plastic Reconstr. Surg. 31 (6) (2015) 166–168.
[24] P.Y. Chua, K.S. Cornish, G. Stenhouse, LW. Barras, A rare case of eccrine porocarcinoma of the eyelid, Semin. Ophthalmol. 30 (6) (2015) 443–445.
[25] R.A. D’Ambrosia, H. Ward, F. Parry, Eccrine porocarcinoma of the eyelid treated with Mohs micrographic surgery, Dermatol. Surg. 30 (4) (2004) 570–571.
[26] E. Belin, K. Ezzedine, S. Stanislav, N. Lalanne, M. Belyot-Berry, A. Taieb, et al., Factors in the surgical management of primary eccrine porocarcinoma: prognostic histological factors can guide the surgical procedure, Br. J. Dermatol. 165 (5) (2011) 985–989.
[27] L.F. Hirsh, H.T. Entnerline, E.F. Rosato, F.E. Rosato, Sweat gland carcinoma, Ann. Surg. 174 (2) (1971) 283.
H. Lati C.C. Lan, H.S. Yu, W.T. Liao, R.C. Hsu, J.C. Chung, K.B. Tsai, et al., Clear cell J. Gutermuth, H. Audring, C. Voit, U. Trefzer, N. Haas, Antitumour activity of M.A. González T. Fujimura, A. Hashimoto, S. Furudate, Y. Kambayashi, T. Haga, S. Aiba, L. Riera Leal, E. Guevara Gutiérrez, et al., Eccrine porocarcinoma with R. Suzaki, T. Shioda, I. Konohana, S. Ishizaki, M. Sawada, M. Tanaka, Der- M. Obi, T. Satoh, H. Yokozeki, K. Nishioka, Eccrine porocarcinoma with W.J. Tidwell, J.E. Mayer, J. Malone, C. Schadt, T. Brown, Treatment of eccrine porocarcinoma with S. Moschella, C.C. Chiu, A. Nanda, S. Aiba, eccrine poroma synonym: porocarcinoma eccrine poroma malignant. J. Evol. Med. S. Moschella, C.C. Chiu, A. Nanda, S. Aiba, eccrine porocarcinoma: J. Evol. Med. S. Moschella, C.C. Chiu, A. Nanda, S. Aiba, eccrine porocarcinoma: a rare sweat gland malignancy, J. Coll. Phys. Surg. Pak 19 (6) (2009) 389–390, J.N. Bogner, D.F. Fullen, L. Love, A. Paulino, J. Sybil Biernack, V.K. Sondak, et al., Lymphatic mapping and sentinel lymph node biopsy in the detection of early metastasis from sweat gland carcinoma, Cancer 97 (9) (2003) 2285–2289, R.C. Chang, K.B. Tsai, Eccrine porocarcinoma of the auricle: a case report, K.J. Cheung, C.Y. Lai, J. Cunha, R.C. Hsu, J.C. Chung, I.P. Tsai, Clear cell eccrine porocarcinoma with extensive cutaneous metastasis and peripheral lymphocyte dysfunction, Br. J. Dermatol. 149 (5) (2003) 1059–1063, H. Latifi, P. Mikaili, N.A. Rezazadeh, S. Taherian, K. Latifi, Malignant eccrine porocarcinoma (eccrine poroma of Kapeloff): a report of a clinical case, Comp. Clin. Pathol. 21 (6) (2012) 1131–1133, C.A. Maguire, V. Kazlouskaya, D. Buchen, P. Heller, D.M. Elston, Porocarcinoma with perineural invasion, Indian Dermatol. Online J. 6 (2) (2015) 122, A.H. Asghar, H. Mahmood, M. Faheem, S. Rizvi, K.A. Khan, Porocarcinoma: an unusual presentation, Eur. J. Plastic Surg. 36 (2) (2013) 131–133, V. De Giorgi, S. Sestini, F. Papi, A.H. Asghar, H. Mahmood, M. Faheem, S. Rizvi, K.A. Khan, Porocarcinoma: an unusual presentation, Eur. J. Plastic Surg. 36 (2) (2013) 131–133, A. Raheemullah, S. Allamani, S. Weber, Incisional biopsy of eccrine porocarcinoma metastasized to a cervical lymph node with CyberKnife radiosurgery, Case Rep. Dermatol. 6 (2) (2012) 159–163, J. Gutermuth, H. Audring, C. Voit, U. Trefzer, N. Haas, Antitumour activity of paclitaxel and interferon-alpha in a case of metastatic eccrine porocarcinoma, J. Eur. Acad. Dermatol. Venereol. 18 (4) (2004) 477–479, C.C. Lao, H.S. Yu, W.T. Liao, R.C. Hsu, J.C. Chung, K.B. Tsai, Eccrine porocarcinoma of the breast in a patient with a history of arsenic exposure: a case report, Int. J. Surg. Pathol. 20 (5) (2012) 515–518, M. Vaz Salgado, C.G. García, M. Llinàs, J. Alonso, E. Guerra, A. Benito, et al., Porocarcinoma: clinicopathological features, J. Dermatol. Surg. 36 (2) (2010) 264–267, F.R. Vlieghe, S.D. Giordano, C.D. Schumack, A.K. Ng, S.E. Russell, L.C. Wang, et al., Metastatic eccrine porocarcinoma after Mohs micrographic surgery: a case report, J. Clin. Oncol. 30 (21) (2012) 188–191, A. Hong, C. Tsuchiya, H. Kondo, N. Honda, S. Shinoda, Subungual malignant eccrine porocarcinoma: a rare case of successful treatment, Int. J. Dermatol. 45 (5) (2006) 330–332, H. Mandaliya, I. Nordman, Metastatic eccrine porocarcinoma: a rare case of successful treatment, Case Rep. Oncol. 9 (2) (2016) 454–456, I. Kurokawa, Y. Urakawa, Y. Senba, E. Kawabata, K. Kishimura, Y. Omoto, K. Tokime, H. Matsuura, A. Tsuha, Keratin profiles may differ between intraepidermal and interdermal invasive eccrine porocarcinoma, Oncol. Rep. 16 (3) (2006) 473–478, A. Labhulwad, M. Salih, H. Kalamak, Rawand A. Essa, Goran M. Rauf, N. S. Müller, C. Zschoche, W. Hartschuh, A.S. Lonsdorf, Zosteriform metastases in a case report and literature review, J. Clin. Exp. Investig. 4 (3) (2013) 370–373, W. Bhat, S. Alkhtar, A. Platt, Primary eccrine porocarcinoma of the face with freckle tumor and axillary metastasis, Ann. Plast. Surg. 66 (4) (2011) 344–346, A. Moniz Torres, A. Pérez Plaza, M. Lamas Velasco, C. Gordillo, D. De Argila, C. García, et al., Eccrine porocarcinoma with extensive cutaneous metastases, Int. J. Dermatol. 55 (5) 2016 156–160, M. Obi, T. Sato, H. Yokozeki, K. Nishiura, Eccrine porocarcinoma with Bowenoid changes: epithelial membrane antigen as a useful marker for malignant tumours arising from eccrine gland structures, Acta Dermato-Venereologica 84 (2004) 142–144, K.I. Serhroughi, T. Harrouche, L. Chibani, H. El Fatemi, M. Sekal, N. Hammami, et al., Eccrine carcinoma: a rare cutaneous neoplasm, Diagn. Pathol. 8 (1) (2013) 15, H.K. Sharathkumar, A.L. Hemalatha, B.R. Deepthi, R.V. AnkitaSoni, Eccrine porocarcinoma: a case report, J. Clin. Diagn. Res. 7 (12) (2013) 2966–2967, L.S. Shef, D.B. MacDougall, Unusual case of porocarcinoma of the foot with no clinically evident dermatologic manifestations, J. Foot Ankle Surg. 44 (5) (2005) 412–414, R. Suzuki, T. Shioda, I. Konohana, S. Ishizaki, M. Sawada, M. Tanaka, Dermatologic features of porocarcinoma arising from hidrocantoma simplex, Dermatol. Res. Pract. 1 (1) (2010), E. Vandeweeyer, C. Renouire, S. Musette, A. Gilles, Eccrine porocarcinoma: a case report, ActaChirurgicaBelgica 106 (1) (2006) 121–123, R. Geel, M.J. Conti, S. Wallace, W. Ward, Metastatic eccrine porocarcinoma, J. Am. Acad. Dermatol. 49 (5) (2003) 252–254, M.A. González López, F. Vázquez López, T. Soler, S. Gómez Díez, Y.H. García, J.A. Manjón, et al., Metastatic eccrine porocarcinoma: a 5.6-Year follow up study of a patient treated with a combined therapeutic protocol, Dermatol.
S.G. Goh, J.F. Dayrit, E. Calonje, Sarcomatoid eccrine porocarcinoma: report of two cases and a review of the literature, J. Cutan. Pathol. 34 (1) (2007) 55–60.

F.D. Cursino, L. Teixeira, E.D. Lima, M.D. Lima, S.C. Rodrigues, D. Takano, Porocarcinoma: case report, An. Bras. Dermatol. 86 (6) (2011) 1201–1204.

T. Nakazawa, T. Kondo, E. Sato, U. Motosugi, D. Niu, K. Mochizuki, et al., Subcutaneous porocarcinoma clinically presenting as a soft tissue tumor, J. Cutan. Pathol. 42 (11) (2015) 897–902.

W. Grayson, J.S. Loubser, Eccrine porocarcinoma of the penis, J. Urol. 169 (2) (2003) 611–612.

H. Ma, M. Liao, S. Qiu, R. Lu, C. Lu, Eccrine poroma and porocarcinoma on the same unusual location: report on two cases, An. Bras. Dermatol. 90 (3) (2015) 69–72.

A. Kalogeraki, D. Tamiolakis, T. Tsagatakis, K. Geronatsiou, V. Haniotis, M. Kafoussi, Eccrine porocarcinoma: cytologic diagnosis by fine needle aspiration biopsy (FNAB), ActaMedica Port. 26 (4) (2013) 467–470.

P.A. Adegbuyega, Eccrine porocarcinoma of the vulva: a case report and review of literature, Int. J. Gynecol. Pathol. 30 (1) (2011) 95–100.

C.M. Choi, H.R. Cho, B.L. Lew, W.Y. Sim, Eccrine porocarcinoma presenting with unusual clinical manifestations: a case report and review of the literature, Ann. Dermatol. 23 (1) (2011) s79–s83.

Y. Kurisu, M. Tsuji, E. Yasuda, Y. Shibayama, A case of eccrine porocarcinoma: usefulness of immunostain for s-100 protein in the diagnoses of recurrent and metastatic dedifferentiated lesions, Ann. Dermatol. 25 (3) (2013) 348–351.

N. Farnar, M. Mohamed, A. Elmobghabi, M. McCann, Eccrine Porocarcinoma presenting as an abdominal wall mass in a patient with ulcerative colitis—a rare case report, Int. J. Surg. Case Rep. 23 (2016) 40–43.

L.Q. Zheng, X.C. Han, Y. Huang, H.W. Li, X.D. Niu, J. Li, Porocarcinoma coexisting at a site of Bowen disease in a 63-year-old woman, Clin. Exp. Dermatol. 40 (3) (2015) 293–297.

D. Hoshina, M. Akiyama, H. Hata, S. Aoyagi, K.C. Sato-Matsumura, H. Shimizu, Eccrine porocarcinoma and Bowen’s disease arising in a seborrhoeic keratosis, Clin. Exp. Dermatol. 32 (1) (2007) 54–56.

J. Jeon, J.H. Kim, Y.S. Baek, A. Kim, S.H. Seo, C.H. Oh, Eccrine poroma and eccrine porocarcinoma in linear epidermal nevus, Am. J. Dermatopathol. 36 (5) (2014) 430–432.

J.B. Lee, C.K. Oh, H.S. Jang, M.B. Kim, B.S. Jang, K.S. Kwon, A case of porocarcinoma from pre-existing hidroacanthoma simplex: need of early excision for hidroacanthoma simplex? Dermatol. Surg. 29 (7) (2003) 772–774.

S.H. Choi, Y.J. Kim, H. Kim, H.J. Kim, H.J. Nam, Y.W. Choi, A rare case of abdominal porocarcinoma, Archiv. Plastic Surg. 41 (1) (2014) 91–93.

E. Lianicelli, A. Galluzzo, P.F. Salvi, V. Ziparo, V. David, A large porocarcinoma of perineal region: MR findings and review of the literature, Abdom. Imaging 33 (6) (2008) 744–747.

L. Borgognoni, L. Pescitelli, C. Urso, P. Brandani, S. Sestini, C. Chiarugi, et al., A rare case of anal porocarcinoma treated by electrochemotherapy, Future Oncol. 10 (15) (2014) 2429–2434.

Arno Rutten, Luis Requena, Celia Requena, Clear-cell porocarcinoma in situ; a cytologic variant of porocarcinoma in situ, Am. J. Dermatopathol. 24 (1) (2000) 67–71.

Further reading

Osamu Yamamoto, Joji Haratake, Shigeo Yokoyama, Shuhei Imayama, Masakazu Asahi, A histopathological and ultrastructural study of eccrine porocarcinoma with special reference to its subtypes, Virchows Arch. A Pathol. Anat. 420 (1992) 395–401.