Ultrasound Features of Merkel Cell Carcinoma in the Right Upper Arm: A Case Report

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ABSTRACT

Merkel cell carcinoma (MCC) is a rare and aggressive neuroendocrine skin cancer, often presenting with nonspecific clinical features. Early diagnosis is crucial for optimal management. This case report details the ultrasound (US) findings in an 80-year old female with a right upper arm MCC. Ultrasound findings help in diagnosis by characterising benign from malignant lesions. The final diagnosis rests with histopathology. This case underscores the importance of incorporating the US into the evaluation of suspicious skin lesions, particularly in high-risk populations, facilitating earlier diagnosis and timely intervention for this aggressive malignancy. Further studies are needed to establish the full spectrum of US features and their prognostic implications in MCC.

Key Words: *Merkel-cell carcinoma, Ultrasound, Neuroendocrine carcinoma, Skin*.

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INTRODUCTION

Merkel cell carcinoma (MCC) is a highly aggressive cutaneous neuroendocrine tumour. The mortality rate of MCC is 46%, nearly four-fold higher than that of invasive melanoma. MCC predominantly affects older adults (≥50 years), with a strong association with immunosuppression and prolonged ultraviolet radiation exposure.[1] The vast majority of MCC cases harbours Merkel cell polyomavirus (MCPyV) DNA, highlighting its critical role in tumourigenesis.[2] However, the precise interplay between viral infection, genetic predisposition, and environmental factors remains incompletely understood.

Diagnosing MCC presents challenges due to its varied clinical presentations, often mimicking benign skin lesions. Clinically, MCC typically presents as a rapidly growing firm nodule, sometimes exhibiting redness or pigmentation.[3] Histopathological examination and immunohistochemistry for neuroendocrine markers remain the gold standard for definitive diagnosis. However, the need for invasive biopsy can delay diagnosis, impacting prognosis.

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Ultrasound (US) offers a non-invasive, readily available imaging modality that can contribute significantly to the preoperative assessment of suspicious skin lesions.[4] While not a replacement for histopathology, US can provide valuable information regarding lesion size, depth, margins, internal echogenicity, and vascularity. Features suggestive of malignancy on US often include irregular margins, heterogeneous echotexture, and increased vascularity.[5] Although the specific US characteristics of MCC are still being defined, its ability to rapidly assess lesions non-invasively makes it a valuable tool.

In this study, the authors report the ultrasound findings of MCC in the right upper arm of an 80-year-old female patient. This case report aimed to contribute to the growing body of knowledge on the US features of MCC, emphasising its potential role in facilitating the earlier diagnosis and improved patient management.

CASE REPORT

An 80-year-old female patient who visited a dermatology clinic reported having a lump in her right upper limb for the last two months, with progressive growth and rupture for one month.

Physical examination revealed a 3 × 3 cm tender mass on the posterior aspect of the right upper arm, protruding approximately 1 cm from the skin surface. The lesion demonstrated erythema, ulceration, minimal exudate, well-defined borders, limited mobility at its base with tenderness (+), and slightly elevated skin temperature. There was no enlargement of the surrounding superficial lymph nodes.

Table I: Imaging of Merkel cell carcinoma.

Publication year	Patients' age/gender	Cancer sites	Mass size	Ultrasound examination	Diagnosis basis
2015[6]	53/female	Right axilla	10 cm	Mass with an irregular shape, indistinct margin, internal hypoechogenicity, and increased peripheral vascularity	Histopathological results
2021[7]	57/female	Breast	5.8 × 3.5 × 6.5 cm	Heterogeneous and irregular	Histopathological and immunostaining results
2023[8]	79/female	Left upper back	2.0 × 1.5 cm	Heterogeneous echogenicity with perpendicular hypoechoic linear bands that resembled "columns of smoke" in the skin and subcutaneous layers	Histopathological results
2023[8]	78/female	Right buttock	3.3 × 1.9 cm	Heterogeneous echogenicity, with hypoechoic linear bands and prominent hypervascularity	Histopathological and immunostaining results

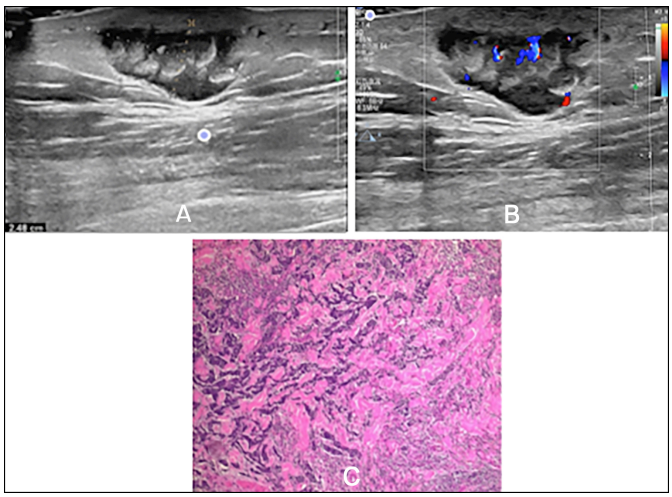

Figure 1: Merkel cell carcinoma of the right upper limb. (A) Subcutaneous mixed echogenic mass on the right upper limb. (B) The CDFI exhibited a higher abundance of blood flow signals within the mixed echoes. (C) Pathological examination showed tumour cells arranged in sheets, islands, nests, and a trabecular distribution.

US of the right upper arm depicted a 2.5 × 1.1 cm hypoechoic, solid mass within the subcutaneous and muscular layers. The mass exhibited poorly defined margins, and it was difficult to accurately define the boundary with the surrounding tissue, especially at the dermo-epidermal junction, and lacked a discernible capsule. Internally, the echotexture was heterogeneous, exhibiting both anechoic regions and increased echogenicity, and the echo was mainly hypoechoic. Surrounding soft tissues displayed increased thickness and echogenicity (Figure 1A). In addition, intra-tumoural and peritumoural vascularity was evident. The colour Doppler US showed abundant blood flow signals in and around the mass, and the blood flow was central. The resistance index (RI) measured by pulsed Doppler was 0.9, indicating high vascular resistance. (Figure 1B). The US findings suggested a solid hypoechoic lesion with peripheral soft tissue oedema.

Following surgical resection, the specimen revealed a 5.0 × 4.5 × 1.5 cm grayish-white-brown mass with a rough surface and indistinct margins. Microscopic examination demonstrated relatively uniform tumour cells arranged in sheets, insular, nested, and trabecular patterns. The cells displayed scant eosinophilic cytoplasm with peripherally located nuclei exhibiting vacuolation and fine granular chromatin, consistent with MCC (Figure 1C). Immunohistochemical (IHC) analysis confirmed the diagnosis, revealing positive staining for Synaptophysin (+), Chromogranin A (+), CD56 (+), CD45 (LCA) (+), with a Ki-67 index of 70%.

DISCUSSION

MCC originated from Merkel cells located in the epidermal base, near the epidermal-dermal interface, and often extends to the subcutaneous adipose tissue. These lesions tend to occur on the head, neck, and limbs and are often misdiagnosed as benign skin abnormalities.[9] However, they possess a high degree of malignancy along with the potential for recurrence and metastasis. In this case study, the patient presented with a subcutaneous palpable mass on the posterior side of the right upper arm that exhibited progressive growth and eventual rupture. This manifestation aligns with the typical clinical characteristics associated with MCC.

The use of US is a well-established method for evaluating both benign and malignant skin lesions, conducting local staging, and monitoring the effectiveness of various inflammatory skin diseases. Inflammatory masses typically present as subcutaneous solid masses with distinct boundaries and uniform internal echoes, accompanied by peripheral reactivity changes such as reduced oedema and blood flow.[10] Conversely, in contrast to these characteristics, the tumour in this case exhibits unclear boundaries, its internal echo appeared uneven, while surrounding soft tissue oedema and increased blood flow suggested a higher likelihood of malignancy. The newly-formed blood vessels in malignant tumours mostly exhibit low-resistance blood flow, and the RI value is usually low. In this study, we observed that the RI was 0.9, which indicated that the blood flow resistance within the tumour was increased. This may be due to the abnormal structure of the newly-formed blood vessels inside the tumour, such as an increase in the fibrous components in the tumour tissue, which impedes the flow of blood. The RI value alone cannot serve as a definitive indicator of tumour malignancy. It is necessary to comprehensively assess the tumour by combining other clinical symptoms and the results of other examinations.

Due to the relative rarity of MCC, data on the sonographic characteristics of this tumour are scant. We reviewed some case reports of MCC, as detailed in Table I.[6-8] Badiu *et al*., presented MCC as a mass or hypoechoic nodule with unclear boundaries at the skin and subcutaneous levels, accompanied by strong intratumoural vascularisation.[11] Aragues *et al*. described the US characteristics of seven histologically confirmed MCC patients and found that solid masses at the dermal subcutaneous level had a mixed echo pattern, mainly composed of hypoechoic areas.[12] US can provide a lot of information for the early diagnosis of MCC. US is not only useful in the diagnostic work-up of MCC, but it can also help to more precisely delimit the tumour prior to complete surgical resection.[12]

According to the results of the pathological examination, the patient was ultimately diagnosed with MCC. The pathogenesis of MCC remains incompletely understood and is currently believed to be associated with factors such as MCPyV infection, immunosuppression, exposure to ultraviolet radiation, and other factors.[2] MCPyV infection plays a pivotal role in the initiation and progression of MCC; however, it alone is not sufficient for its occurrence, necessitating synergistic interactions with other genetic and environmental factors. The patient in this case presented with advanced age, compromised physical condition, and diminished immune function, all of which are prominent risk factors for MCC. Furthermore, being a neuroendocrine tumour, MCC also exhibits a certain degree of genetic susceptibility and may be associated with specific gene mutations such as the inactivation of tumour suppressor genes such as *TP53* and *RB1*.[13] Therefore, it is imperative to enhance screening measures and follow-up protocols for early detection and treatment among high-risk populations.

In conclusion, US aids in the diagnosis of benign *vs*. malignant lesions and helps narrow down the differential diagnosis. In combination with clinical examination, it can diagnose malignant lesions with a high degree of accuracy. While the US may not provide a definitive diagnosis, its ability to characterise lesion morphology, vascularity, and surrounding tissue changes contributes significantly to preoperative risk stratification and guides subsequent management. Further research is needed to establish more precise US criteria for MCC and to refine the role of the US in monitoring treatment response and detecting recurrence.

ETHICAL APPROVAL:
This study was conducted after obtaining approval from the Ethics Committee of Yichang Central People's Hospital, Yichang, China (No: 2024-475-01).

PATIENT'S CONSENT:
Consent was obtained from the patient.

COMPETING INTEREST:
The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
ZY: Concept of the study, design, data analysis, and data interpretation.
XL: Recollected patient information.
BX: Revision for intellectual content.
All authors approved the final version of the manuscript to be published.

REFERENCES

1. Thakker S, Venna S, Belzberg M, Jang S, De Simone J, Mondhiry JA. Merkel cell carcinoma. *J Am Acad Dermatol* 2024; **91(3)**: 598-605. doi: 10.1016/j.jaad.2024.04.039.
2. De Caprio JA. Molecular pathogenesis of Merkel cell carcinoma. *Annu Rev Pathol* 2021; **16**:69-91. doi: 10.1146/annurev-pathmechdis-012419-032817.
3. Becker JC, Stang A, Schrama D, Ugurel S. Merkel cell carcinoma: Integrating epidemiology, immunology, and therapeutic updates. *Am J Clin Dermatol* 2024; **25(4)**:541-57. doi: 10.1007/s40257-024-00858-z.
4. Vergilio MM, Monteiro E Silva SA, Jales RM, Leonardi GR. High-frequency ultrasound as a scientific tool for skin imaging analysis. *Exp Dermatol* 2021; **30(7)**:897-910. doi: 10.1111/exd.14363.
5. Zhang G, Ye HR, Sun Y, Guo ZZ. Ultrasound molecular imaging and its applications in cancer diagnosis and therapy. *ACS Sens* 2022; **7(10)**:2857-64. doi: 10.1021/acssensors.2c01468.
6. Baek SH, Jung HK, Kim W, Kim SJ, Baek HJ, Kim SH, *et al*. Merkel cell carcinoma of the axilla and adrenal gland: A case report with imaging and pathologic findings. *Case Rep Med* 2015; **2015**: 931238. doi: 10.1155/2015/931238.
7. Mehta N, Dodelzon K, Ginter PS, Mema E. Merkel cell carcinoma of the breast: A case report. *Clin Imaging* 2021; **78**:271-5. doi: 10.1016/j.clinimag.2021.06.010.
8. Oh HY, Kim D, Choi YS, Kim E, Kim TE. Merkel cell carcinoma of the trunk: Two case reports and imaging review. *J Korean Soc Radiol* 2023; **84(5)**:1134-9. doi: 10.3348/jksr.2022.0148.
9. Akaike G, Akaike T, Fadl SA, Lachance K, Nghiem P, Behnia F. Imaging of Merkel cell carcinoma: What imaging experts should know. *Radiographics* 2019; **39(7)**:2069-84. doi: 10.1148/rg.2019190102.
10. Crisan D, Wortsman X, Alfageme F, Catalano O, Badea A, Kochanek KS, *et al*. Ultrasonography in dermatologic surgery: Revealing the unseen for improved surgical planning. *J Dtsch Dermatol Ges* 2022; **20(7)**:913-26. doi: 10.1111/ddg.14781.
11. Badiu IM, Korecka K, Orzan AO, Spadafora M, Longo C, Forsea AM, *et al*. A Review of non-invasive skin imaging in Merkel cell carcinoma: Diagnostic utility and clinical implications. *Cancers (Basel)* 2024; **16(21)**:3586. doi: 10.3390/cancers16213586.
12. Aragues IH, Osorio IV, Alfageme F, Blanco CC, Fernandez LC, Blanco MIR, *et al*. Skin ultrasound features of Merkel cell carcinoma. *J Eur Acad Dermatol Venereol* 2017; **31(7)**:e315-8. doi: 10.1111/jdv.14102.
13. Kaufman HL, Russell J, Hamid O, Bhatia S, Terheyden P, D'Angelo SP, *et al*. Avelumab in patients with chemotherapy-refractory metastatic merkel cell carcinoma: A multicenter, single-group, open-label, phase 2 trial. *Lancet Oncol* 2016; **17(10)**:1374-85. doi: 10.1016/S1470-2045(16)30364-3.