

Case Report

# Resection of Renal Cell and Prostate Carcinoma Sternum Metastases with Long-Term Follow-Up: A Report of 2 Cases

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## Keywords

Sternum metastasis · Renal cell carcinoma · Prostate carcinoma

## Abstract

**Introduction:** Rarely solitary sternum metastases are addressed by resection. Two additional cases are presented as they are interesting because of their long-term follow-up. **Case Presentation:** Case 1: A renal cell carcinoma was treated by transabdominal nephrectomy at age 64. Right iliac bone and sternum metastases were diagnosed 7 months later and treated by internal hemipelvectomy followed by sternum metastasectomy 6 weeks after the internal hemipelvectomy. At 12-year follow-up, the patient appears disease free. Case 2: Prostate cancer was treated by prostatectomy at age 67. A subsequent solitary sternum metastasis was resected 10 years later for persistent PSA-activity despite repeated radiotherapy. The patient remains asymptomatic for 3 years now. **Conclusion:** Resection of sternum metastases may have curative potential and should be considered in tumours known to be rather resistant to chemo- and/or radiotherapy.

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## Introduction

Treatment of primary malignant tumours without metastases is generally straight forward and can mostly follow established protocols. However, with metastases present, either syn- or metachronous, therapeutic decisions are highly individualized, hence more challenging.

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**Fig. 1.** Case 1. MRI of the pelvis 7 months after nephrectomy showing the metastasis in the iliac bone. **a** Coronal. **b, c** Transverse images.

Bone metastases most frequently from prostate and kidney cancer – in 65–90% [1] and 20–25% [2], respectively – cause various problems, e.g., pain, pathologic fracture, nerve compression, restrictions in quality of life, etc. [3]. Treatment options available include surgery, radiation, embolization, chemotherapy, targeted therapy, radiofrequency thermal ablation, high intensity focused ultrasound, and others [3].

Once bone metastases have developed palliative treatment is often chosen. However, a curative approach should always be the “gold standard”. Therefore, this report shall help consider a more radical approach in selected cases.

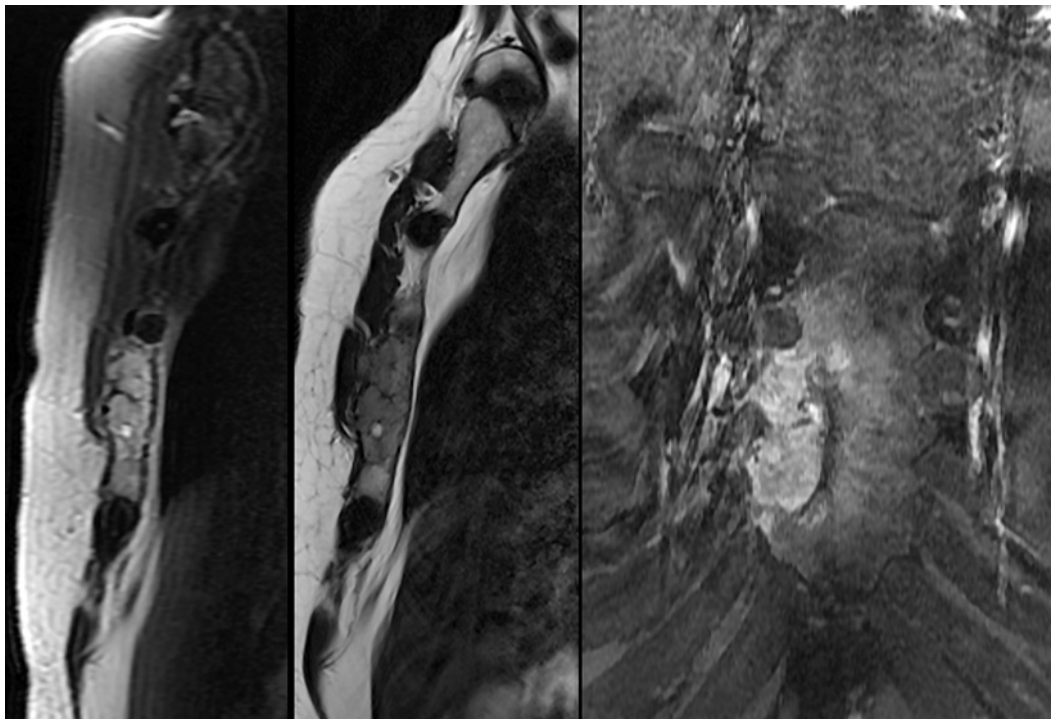
## Case Reports

### Case 1 (E.R. \*1946)

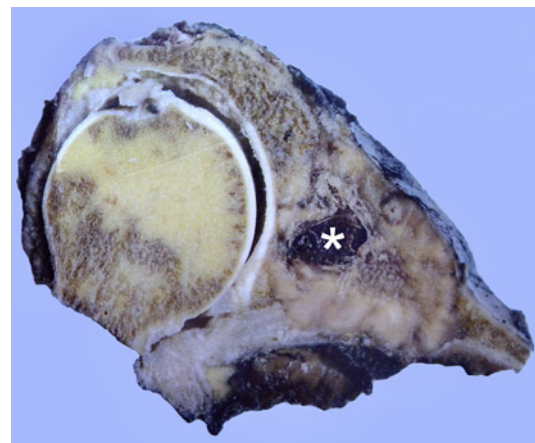
Abdominal CT and ultrasound revealed a lesion of the left kidney at the age of 64 years in 2010. Open transabdominal tumour-nephrectomy was performed in January 2011. Histology confirmed a clear cell renal carcinoma (Staging: G1 pt1a V0 R0). No further staging was performed at that time. Right hip pain 7 months later prompted further imaging revealing an osteolytic process in the right supra-acetabular iliac bone (Fig. 1) and in the sternum (Fig. 2). A percutaneous core biopsy of the iliac lesion with decontamination of the biopsy path by RF-ablation confirmed the metastasis of a clear cell renal cell carcinoma (Vimentin and CD 10 positive, CK7/CK 10 negative, Fuhrmann grade II). Transarterial embolization followed by en bloc hip joint resection (Fig. 3) and reconstruction by a cementless LUMIC® (implantcast®) endoprosthesis (Fig. 4) was subsequently performed. An extralesional en bloc resection of the sternal metastasis followed 6 weeks later (histology findings proving metastasis of a clear cell renal metastasis are presented in Fig. 5). At recent follow-up in June 2023, the patient feels unrestricted with symmetric hip function despite leg length discrepancy and without sternal discomfort. Hip reconstruction is stable without signs of loosening (Fig. 4).

### Case 2 (R.S. \*1943)

Radical prostatectomy was performed in 2010 at the age of 67 years. Histology confirmed multifocal acinar adenocarcinoma within clear resection margins (Staging: pT2c N0 R0, Gleason Score 3 + 4 = 7a). Secondary increase of prostate-specific antigen (PSA) levels from <0.1 ng/mL to 2.71 ng/mL was observed in 2013. 18F-Fluorocholine PET-CT revealed a solitary active sternal focus at the level of rib 5–7; biopsy (Fig. 6) confirmed prostate cancer metastasis. While we recommended local resection of this



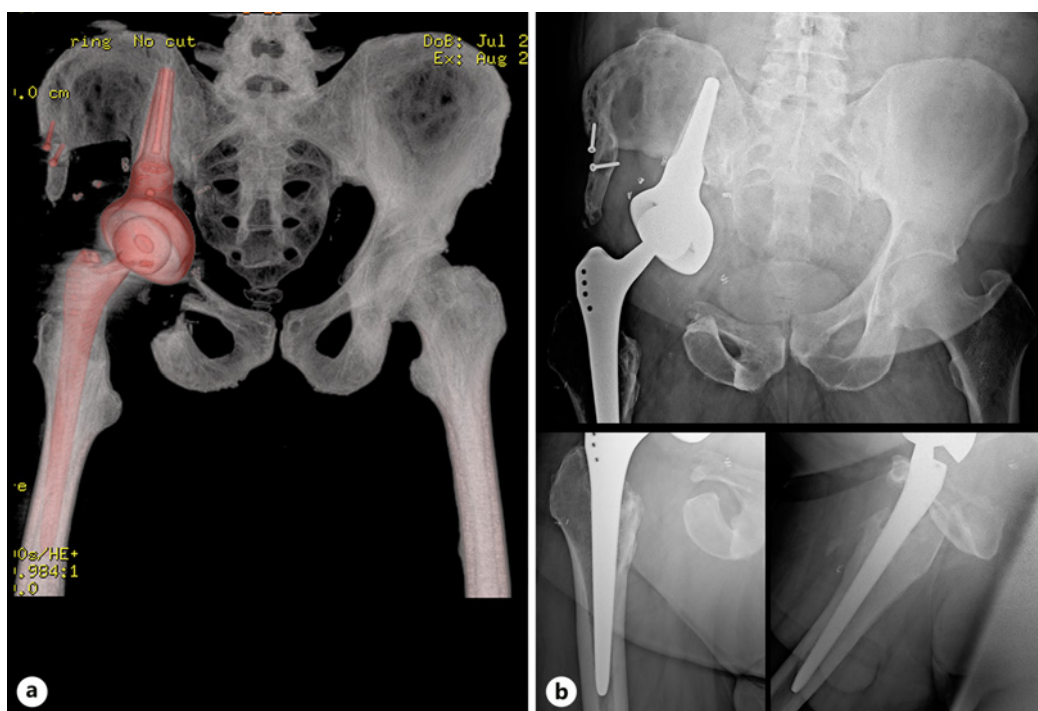
**Fig. 2.** Sagittal and coronal sternum MRIs of the renal cancer metastasis September 2011.



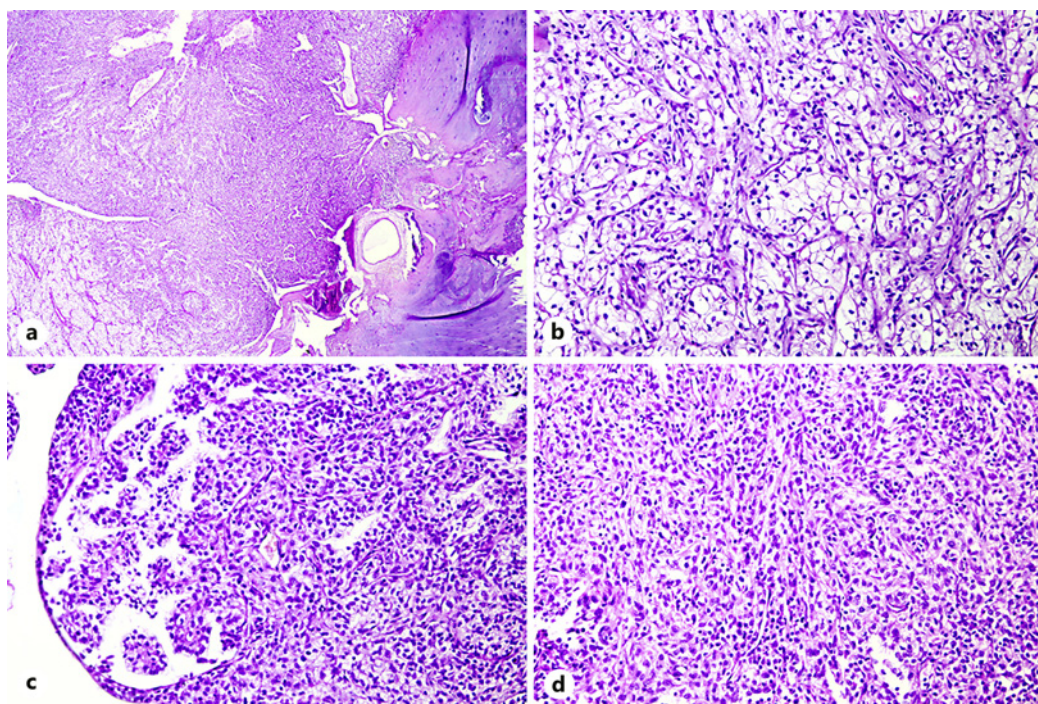
**Fig. 3.** Transverse cut through the centre of the resected hip joint showing the necrotic centre (\*) within the renal cancer metastasis surrounded by the intact pseudocapsule.

solitary lesion, the patient opted for radiotherapy. After irradiation with 39 Gy PSA decreased until recurrent increase 4 years later due to a new active lesion distal to the prior irradiated field. Again irradiation with 30 Gy applied by Cyber knife led to decreased PSA. 3 years later, in 2020, PSA increased to 2.01 ng/mL and a painful pathologic sternal fracture across the irradiated field (Fig. 7, 8) occurred. After wide resection of the sternum distal to the 3rd rib with tumour-free margins (Fig. 9) and proof of active metastasis (Fig. 10), PSA is normal at 3-year follow-up. Despite the large sternal defect, the patient only feels minor discomfort at the free ends of the ribs.

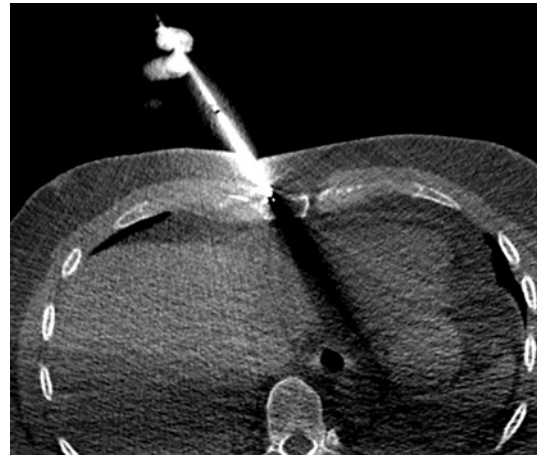




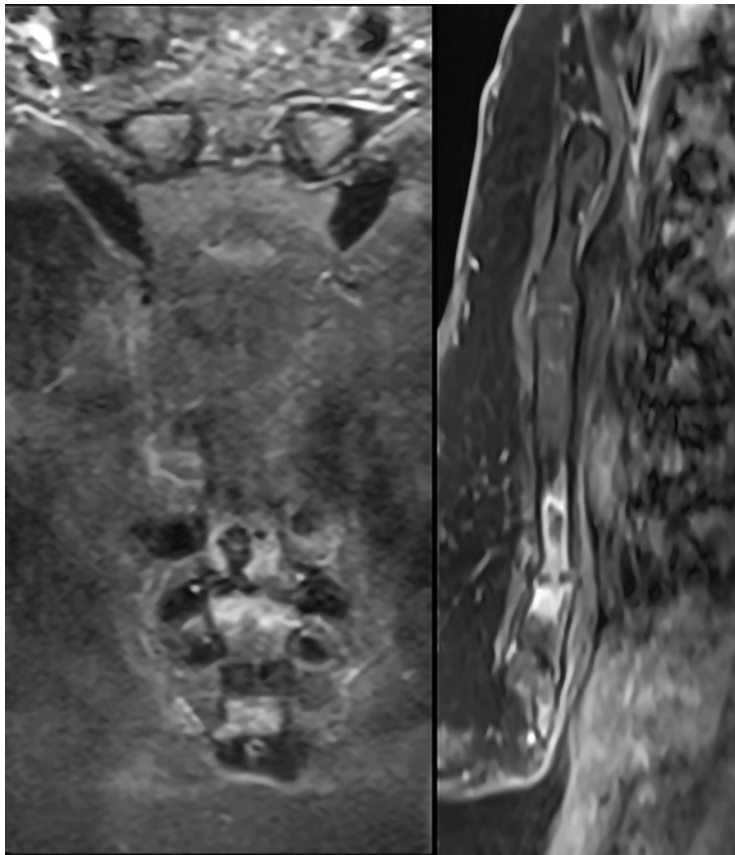
**Fig. 4.** 3D-CT – reconstruction image (a), August 2011 10 days after resection of the metastasis and reconstruction with LUMIC® endoprosthesis. X-ray documentation (b) 12 years later June 2023.



**Fig. 5.** Pathology slides of the clear cell renal cell sternum metastasis: overview of renal cell carcinoma metastasis on the left side of the microphotograph with the sternal bone and cartilage on the right edge (a), classical clear cell carcinoma with low-grade nuclei devoid of prominent nucleoli (b), focal papillary pattern of clear cell carcinoma (c), partial spindle cell growth pattern (d). Standard haematoxylin/eosin staining. Overview field of view 5\*3.3 mm, high power microphotographs with field of view 0.625\*0.413 mm.



**Fig. 6.** Case 2. CT-guided biopsy of the prostate sternum metastasis (2013) 3 years after prostatectomy (2010).

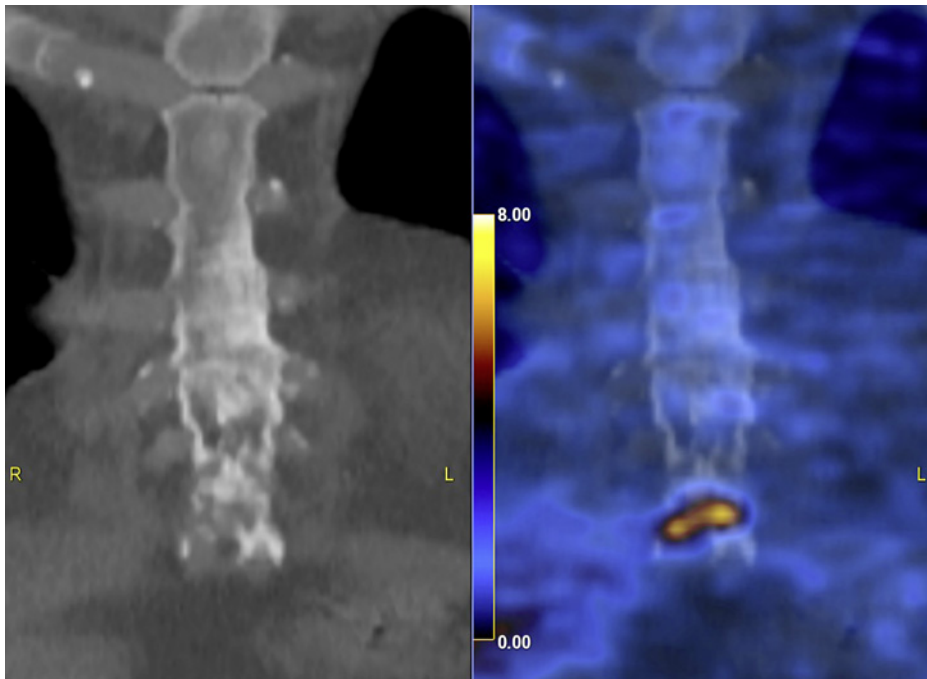


**Fig. 7.** Coronal and sagittal MRI of the sternum documenting the extent of the lesion in 2020.

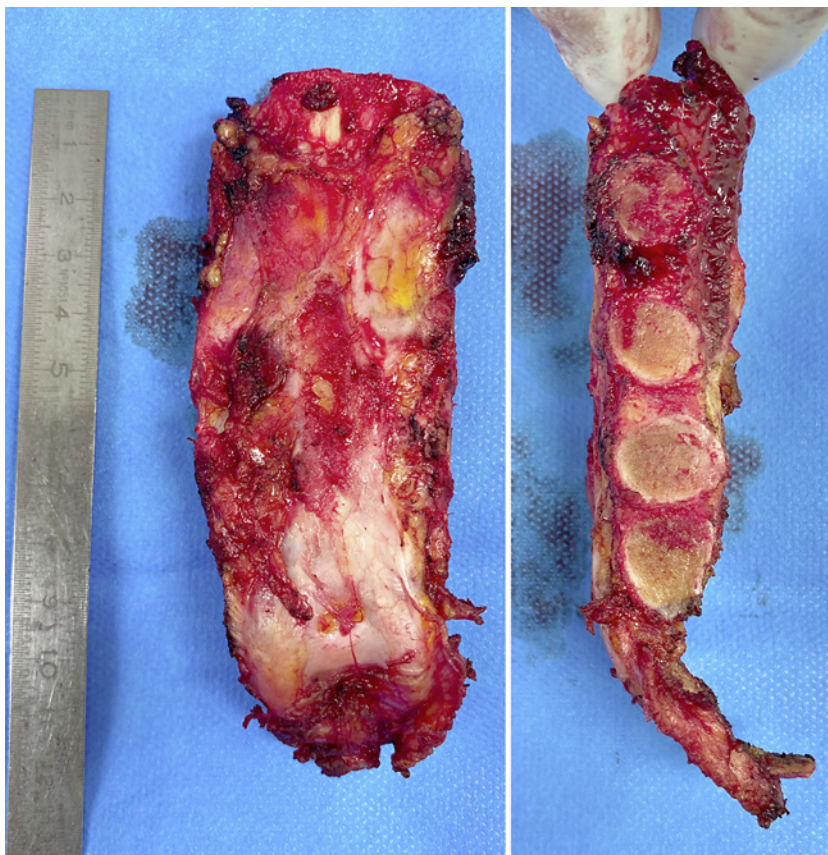
### Discussion

Treatment of metastatic bone disease is challenging and needs an integrative approach. Most important is to estimate as best as possible the prognosis of the patient, depending on several factors; e.g., type of primary tumour, patient age, preceding treatment, time interval between occurrence of primary tumour and metastases, number and location of metastases.

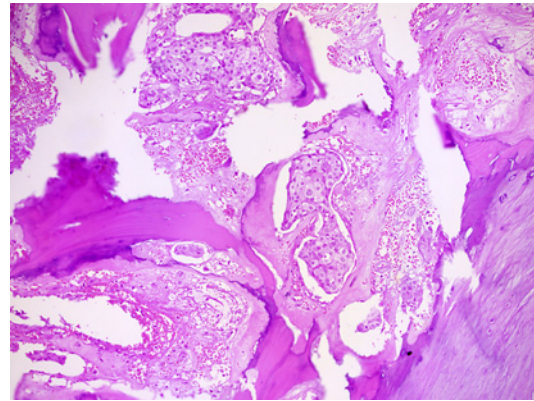




**Fig. 8.** 18F-PSMA PET – CT showing the extensive osteolysis of the sternum and the focal radionuclide uptake supporting prostate cancer tumour activity.



**Fig. 9.** Resected sternum segment distal to the level between 3rd and 4th ribs.



**Fig. 10.** Pathology slide of the resected sternum showing intertrabecular infiltrates of an acinar adenocarcinoma of the prostate with characteristic prominent nucleoli. HE, magnification  $\times 10$ .

All treatment options have side effects that need to be in balance with the potential for improvement. Mutilating treatment is an option only in cases, where no other means would have a positive effect on quality of life to control pain or improving survival.

The occurrence of metastases is usually a sign of progressive disease. However, all treatments should primarily be curative. Aggressive local treatment of metastases may be indicated despite impaired prognosis for optimal local control but most importantly to preserve curative potential. Local measures for oligometastatic disease are surgical resection, radiotherapy, locally heating/freezing measures, or combinations. Biopsy of lesions suspicious of metastasis is also recommended even with known primary tumour [4] to avoid pitfalls, and therefore biopsies also were done in the cases presented herein. Renal clear cell cancer is typically radioresistant and surgery is advised for solitary metachronous R0-resectable lesions [5–11].

Publications on resection of solitary sternum metastases are case reports only, e.g., for breast cancer [12], thyroid carcinoma [13, 14], renal cell carcinoma [15], and with review of the case reports published before [16], and other not further specified tumours [17]. A case with an isolated sternum metastasis from prostate cancer was discussed by Corkum and Experts [18], but no definitive answer was provided. At present, the standard for the local treatment of oligometastatic prostate cancer is radiotherapy [19].

Treatment strategies will hopefully soon change with the expected improvements related to immunotherapy [20–23] and less need for aggressive surgery. The CARE checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see <https://doi.org/10.1159/000536350>).

## Conclusions

Our two cases with a positive long-term outcome may contribute to the decision-making of treating exceptional problems of metastases accessible to surgical resection in radioresistant lesions.

## Statements of Ethics

This retrospective review of patient data did not require ethical approval in accordance with local/national guidelines (Kantonale Ethikkommission, Kanton Zürich). Written informed consent was obtained from the patients for publication of their medical case and any accompanying images. All details and radiographic images have been deidentified to protect patient confidentiality.

### Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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### Author Contributions

Dres. P.A. Berdat, P.R. Vogt, P.A. Schai, M.B. Brück, and G.U. Exner have planned and performed the surgical strategies of case 1, P.A. Berdat, G.U. Exner and C. Rüedi of case 2. M.O. Kurrer has performed the pathologic examinations. All authors participated equally in the conception of the study, writing the manuscript, and proofreading the final version.

### Data Availability Statement

Besides the data included in the article, further enquiries can be directed to the corresponding author.

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