



# Erosive effects of a posterior mediastinal mass in a 18th to early 19th c. Spanish child mummy

DOI:

[10.1007/s12024-018-0013-8](https://doi.org/10.1007/s12024-018-0013-8)

## Document Version

Accepted author manuscript

[Link to publication record in Manchester Research Explorer](#)

## Citation for published version (APA):

Loynes, R. D., Charlier, P., Perciaccante, A., Gonzalez, M., Begerock, A., & Bianucci, R. (2018). Erosive effects of a posterior mediastinal mass in a 18th to early 19th c. Spanish child mummy. *Forensic Science, Medicine, and Pathology*, 14(4), 574-578. <https://doi.org/10.1007/s12024-018-0013-8>

## Published in:

Forensic Science, Medicine, and Pathology

## Citing this paper

Please note that where the full-text provided on Manchester Research Explorer is the Author Accepted Manuscript or Proof version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version.

## General rights

Copyright and moral rights for the publications made accessible in the Research Explorer are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

## Takedown policy

If you believe that this document breaches copyright please refer to the University of Manchester's Takedown Procedures [<http://man.ac.uk/04Y6Bo>] or contact [uml.scholarlycommunications@manchester.ac.uk](mailto:uml.scholarlycommunications@manchester.ac.uk) providing relevant details, so we can investigate your claim.



# Forensic Science, Medicine and Pathology

## Erosive effects of a posterior mediastinal mass in a 19th c. Spanish child mummy

--Manuscript Draft--

<b>Manuscript Number:</b>	FSMP-D-18-00156R2
<b>Full Title:</b>	Erosive effects of a posterior mediastinal mass in a 19th c. Spanish child mummy
<b>Article Type:</b>	Lessons from the Museum
<b>Keywords:</b>	Natural mummies; Mummy Museum of Quinto; Paleopathology; Neurenteric Cysts
<b>Order of Authors:</b>	Robert Loynes, Ph.D., M.Ch.Orth., FRCS Philippe Charlier, MD, PhD Antonio Perciaccante, MD Mercedes Gonzales, BSc Anna Maria Begerock, PhD Raffaella Bianucci, PhD
<b>Corresponding Author:</b>	Robert Loynes, Ph.D., M.Ch.Orth., FRCS University of Manchester Manchester, UNITED KINGDOM
<b>Corresponding Author Secondary Information:</b>	
<b>Corresponding Author's Institution:</b>	University of Manchester
<b>Corresponding Author's Secondary Institution:</b>	
<b>First Author:</b>	Robert Loynes, Ph.D., M.Ch.Orth., FRCS
<b>First Author Secondary Information:</b>	
<b>Order of Authors Secondary Information:</b>	
<b>Funding Information:</b>	
<b>Abstract:</b>	<p>During the restoration works in 2011 in the central nave of the church of the Assumption of Our Lady- known as "The Piquete"- in the village of Quinto (about 50 kms southwest of Zaragoza, Spain), the remains of 70 individuals were uncovered. Of these there were thirty-two mummified bodies four of which have been investigated with CT scans.</p> <p>Here we report on the findings in one such individual, namely a child of between seven and eight years of age. The sex is debatable but may well be female.</p> <p>The main pathological finding is the presence of pressure erosion and distortion of the upper thoracic spine, the cause of which is discussed with the conclusion that this may well represent a neurenteric duplication cyst. The possible consequences of such a lesion are considered</p>
<b>Response to Reviewers:</b>	Corrections all made

**Erosive effects of a posterior mediastinal mass in a 18th to early 19th c. Spanish child mummy**

**Loynes R.D.,<sup>1</sup> Charlier P.<sup>2-3</sup>, Perciaccante A.<sup>4</sup>, Gonzalez M.<sup>5</sup>, Begerock A.<sup>5</sup>, Bianucci R.<sup>6-8</sup>**

<sup>1</sup>KNH Centre for Biomedical Egyptology, University of Manchester, 3.5 Stopford Building, Oxford Road, Manchester M13 9PT, UK; [robert.loynes@manchester.ac.uk](mailto:robert.loynes@manchester.ac.uk)

<sup>2</sup> Section of Medical and Forensic Anthropology (UVSQ DANTE Laboratory EA 4498), Montigny-Le-Bretonneux, France; [ph\\_charlier@yahoo.fr](mailto:ph_charlier@yahoo.fr)

<sup>3</sup> CASH & IPES, Nanterre, France.

<sup>4</sup>Department of Medicine, San Giovanni di Dio Hospital, Gorizia, Italy; [antonioperciaccante@libero.it](mailto:antonioperciaccante@libero.it)

<sup>5</sup>Institute for the Scientific Study of Mummies (IECIM). Madrid, Spain; [mgonzalez.iecim@gmail.com](mailto:mgonzalez.iecim@gmail.com); [abegerock.iecim@gmail.com](mailto:abegerock.iecim@gmail.com)

<sup>6</sup>Legal Medicine Section, Department of Public Health and Paediatric Sciences, University of Turin, Italy. [raffaella.bianucci@unito.it](mailto:raffaella.bianucci@unito.it)

<sup>7</sup>Warwick Medical School, Microbiology and Infection Unit, The University of Warwick, United Kingdom.

<sup>8</sup>UMR 7268, Laboratoire d'Anthropologie bio-culturelle, Droit, Etique & Santé (Adés), Faculté de Médecine de Marseille, France.

Word Count. 1263

1  
2 Abstract  
3

4 During the restoration works in 2011 in the central nave of the church of the Assumption of  
5 Our Lady- known as “The Piquete”- in the village of Quinto (about 50 kms southwest of  
6  
7 Zaragoza, Spain), the remains of 70 individuals were uncovered. Of these there were thirty-  
8  
9 two mummified bodies four of which have been investigated with CT scans.  
10  
11

12 Here we report on the findings in one such individual, namely a child of between seven and  
13  
14 eight years of age. The sex is debatable but may well be female.  
15  
16

17 The main pathological finding is the presence of pressure erosion and distortion of the upper  
18  
19 thoracic spine, the cause of which is discussed with the conclusion that this may well  
20  
21 represent a neurenteric duplication cyst. The possible consequences of such a lesion are  
22  
23 considered.  
24  
25  
26  
27  
28  
29  
30

31 Key Words  
32

33  
34 Natural mummies; Mummy Museum of Quinto; Paleopathology; Neurenteric Cysts  
35  
36  
37  
38

39 Case Report  
40

41 Here we report a probable case of erosion of the spine due a posterior mediastinal mass in an  
42  
43 18th to early 19th century Spanish natural child mummy (ID PQ31) (**Figure 1a**). This  
44  
45 individual along with fourteen other naturally mummified persons represent the core of the  
46  
47 newly created Museum of Quinto (ca 50 kms southwest of Zaragoza, Spain).  
48  
49

50 Sex, age at death, the possible cause of death, and the degree of preservation of the body were  
51  
52 established using Multidetector Computed Tomography (Siemens machine with a slice  
53  
54 thickness of 1 mm). The sex of the body is possibly female as indicated by the presence of a  
55  
56 wide sacral notch and a wide sub-pubic angle. (**Figure 1b**).  
57  
58  
59  
60  
61  
62  
63  
64  
65

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65

However, direct visualization of the body has shown a flap of soft tissue over the lower anterior abdominal wall that could indicate the remains of a scrotum. The presence of redundant anterior wall skin has also to be considered since remains of a phallus are not found. The age at death, as judged by the dentition - is between 7 and 8 years. [1] (**Figure 1c**).

The body itself has disintegrated to an extent as a result of a lack of embalming and has subsequently been restored. Unfortunately, restoration included threading of the vertebrae over a wooden “rod”.

Nevertheless, parts of the skeleton are approximately in the correct relationship to one another. Most of the epiphyses have disappeared. The upper humeral and upper femoral epiphyses are exceptions. However, the left upper humeral epiphysis is subluxed and the right superior femoral epiphysis is minimally slipped laterally (post-mortem). The right foot lacks the toes, but the left foot remains intact. The hands are clasped together but the right forearm is detached and lies on the right side of the body (**Figure 1d**).

The CT scan images show that the posterior and middle cranial fossae contain desiccated cerebral material (**Figure 2a**) and remnants of the meninges are seen hanging from the skull vault. Both eyes have been retained within the orbits and are desiccated (**Figure 2b**).

The joint between the sphenoid and the basilar part of the occiput has disintegrated allowing disruption of this region. A complete dislocation of the atlanto-occipital and atlanto-axial joints causing separation of the base of the skull, the atlas and the odontoid peg of the axis can be seen. There is, also, dislocation of C2 and C3 (**Figure 2 c, d**). Further disruption occurs at the C7/T1 level but whether this is related to restoration is impossible to say. Disruption has also occurred within the thorax with dislocation of some of the ribs. There is evidence of structures within the cavity but these are unrecognizable as specific anatomical entities. The main feature of the thorax is the deformed spine (**Figure 3a**). The continuity of the spine is interrupted at several levels. The upper thoracic spine is abnormal with rotation of

1 the vertebrae and distortion of the anterior aspects of the bodies of T2, T3 and T4. This appears  
2 to be the result of external pressure anterior to the spine caused by a mass (approximately 3.5  
3 cms in diameter), which is not connected to the spinal canal.  
4  
5  
6  
7  
8

### 9 Discussion

10 The differential diagnosis includes the development of a chronic abscess, aortic dilatation at  
11 the level of the arch (i.e. an aneurysm due to congenital syphilis or coarctation), and benign  
12 and malignant masses. Congenital syphilis can be excluded since the child does not display the  
13 typical signs of the disease (Hutchison's teeth, mulberry molars, periosteal lesions of the long  
14 bones, focal destruction and bone loss) [2]. As to coarctation of the aorta, this results in  
15 dilatation of the ascending aorta, which is unlikely to cause compressive erosion of the  
16 vertebral bodies. Also it leads to "notching of the ribs" as the result of the collateral circulation,  
17 a condition which was not observed in the CT scan images (**Figure 3c**) [3]  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30

31 A chronic abscess would result in a "ragged" appearance of the anterior walls of the vertebral  
32 bodies, whereas in this case the margins are smooth [4] (**Figure 3d**)  
33  
34  
35

36 It is proposed that these are the erosive effects of a posterior mediastinal mass. A variety of  
37 mediastinal masses contain cystic areas and have variable prognoses. [5] Cysts comprise 15%–  
38 20% of all mediastinal masses [3] and occur in all compartments of the mediastinum. In the  
39 living, characterization of these cystic lesions may at times be difficult owing to the variable  
40 composition of fluid and associated complications such as haemorrhage or infection. Posterior  
41 mediastinal masses include: oesophageal duplication cysts, myelomeningocele and neurenteric  
42 anomalies. Primary spinal tumours (benign and malignant) at the thoracic level in children aged  
43 between 5 and 10 years include aneurysmal bone cyst, eosinophilic granuloma and  
44 osteosarcoma. [6]  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57

58 Although there is evidence of structures within the cavity these are unrecognizable as specific  
59  
60  
61  
62  
63  
64  
65

1 anatomical entities, therefore a retrospective diagnosis concerning the type of cystic lesion and  
2 its composition is impossible. Due to the absence of an association with the neural tube, any  
3  
4  
5 cause within the spinal canal (such as purely neural tumors - e.g. neurofibromata) can be  
6  
7 excluded as the "pressure erosion" is anterior. [7]  
8

9 This leaves us with space occupying lesions anterior to the vertebral body i.e. in the posterior  
10  
11 part of the thoracic cavity/posterior mediastinum. The deformity of the vertebral bodies has  
12  
13 been caused by a benign lesion as there is no evidence of infiltration.  
14  
15

16 Oesophageal duplication cysts are developmental in origin and are classified as foregut cysts  
17  
18 that are either bronchogenic or neurenteric. [7] Neurenteric cysts are duplication of the  
19  
20 alimentary canal associated with a variety of malformations of the spinal column and cord  
21  
22 (posterior mediastinal neurenteric cyst). [7] Esophageal duplication cysts are uncommon.  
23  
24 Many are asymptomatic, but they may cause dysphagia, pain, or other symptoms owing to  
25  
26 compression of adjacent structures. [8] The majority are detected in infants or children usually  
27  
28 adjacent to or within the oesophageal wall. [9-13]  
29  
30  
31  
32

33 Duplication cysts can present with life-threatening complications such as malignant change,  
34  
35 ulceration, bleeding, and rupture with consequent mediastinitis and peritonitis. Ectopic gastric  
36  
37 mucosa in the cyst may cause haemorrhage or perforation of the cyst, or infection. Duplication  
38  
39 cysts are most commonly found in the posterior mediastinum to the right of the distal  
40  
41 oesophagus and do not communicate with the lumen. When symptomatic, the symptoms and  
42  
43 signs are related to compression of a thoracic-abdominal structure by the enlarged cystic mass.  
44  
45

46 Symptoms and signs include abdominal pain, vomiting, dysphagia, bleeding, anorexia, weight  
47  
48 loss, dyspnea, cough, precordial pain, arrhythmias, and, less commonly, obstruction. [9-13]  
49  
50

51 No specific cause of death is shown in this case. However, although benign, duplication cysts  
52  
53 in this position can be complicated by respiratory problems including mechanical obstruction  
54  
55 and infection. Whilst there is no definitive proof of this, the possibility must be acknowledged.  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65

## References

1. Scheuer, L., Black, S. *Developmental Juvenile Osteology*. Academic Press, London: 2000. pp. 61-63, 76-80, 84-88.
2. Tomczyk J , Mańkowska-Pliszka H, Palczewski P, Olczak-Kowalczyk D. Congenital syphilis in the skeleton of a child from Poland (Radom, 18th–19th century , AD). *Anthropological Review* 2015; 78 (1): 79–90.
3. Aydin E, Aypar E, Oktem A, Ozyuncu O, Yurdakok M, Guvener M et al. Congenital heart defects: the 10-year experience at a single center. *J Matern Fetal Neonatal Med*. 2018; 18:1-121; <https://doi.org/10.1080/14767058.2018.1491029>.
4. Raghavan M, Lazzeri E, Palestro CJ. Imaging of Spondyloarthritis. *Semin. Nucl. Med*. 2018; 48(2): 131-147.
5. Jeung MJ, Gasser B, Gangi A, Bogorin A, Charneau D, Wihlm JM et al. Imaging of Cystic Masses of the Mediastinum. *RadioGraphics* 2002; 22(1): [https://doi.org/10.1148/radiographics.22.suppl\\_1.g02oc09s79](https://doi.org/10.1148/radiographics.22.suppl_1.g02oc09s79)
6. Oldham HN, Jr. *Mediastinal tumors and cysts (collective review)*. *Ann Thorac Surg* 1971; 11:246-275.
7. Ravindra VM, Eli IM, Schmidt MH, Brockmeyer DL Primary osseous tumors of the pediatric spinal column: review of pathology and surgical decision making. *Neurosurg Focus* 2016; 41 (2); <https://doi.org/10.3171/2016.5.FOCUS16155>.
8. Fitch SJ, Tonkin IL, Tonkin AK. Imaging of foregut duplication cysts. *RadioGraphics* 1986; 6:189-201.
10. Demirbilek S, Kanmaz T, Bitiren M, Yücesan S. Mediastinal Neurenteric Cyst in a Child. *İnönü Üniversitesi Tıp Fakültesi Dergisi* 2005; 12(1): 41-43.
11. Salo JA, Ala-Kulju K. Congenital esophageal cysts in adults. *Ann Thorac Surg* 1987;



44:135-138.

1  
2 12. Geller A, Wang KK, Dimagno EP. Diagnosis of Foregut Duplication Cysts by  
3  
4 Endoscopic Ultrasonography. Gastroenterology 1995; 109: 838-842.  
5  
6

7 13. Bagwan M R, Reddy S M, Pardeshi C Z, Panicker S, Kumar K. Neurenteric Cyst of  
8  
9 Posterior Mediastinum in an Infant: Case Report. Int J Sci Stud 2016; 3(11): 280-283.  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65



Fig 1a



Fig 1b

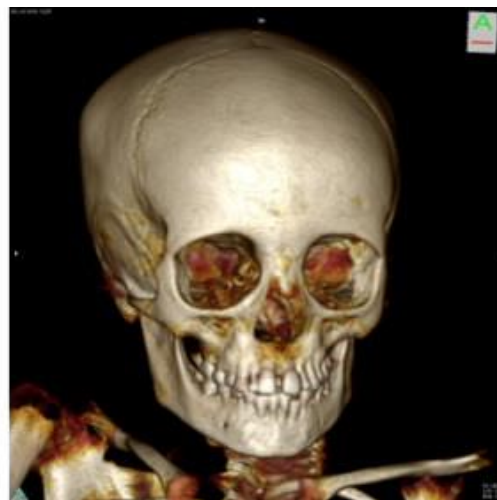


Fig 1c



Fig 1d

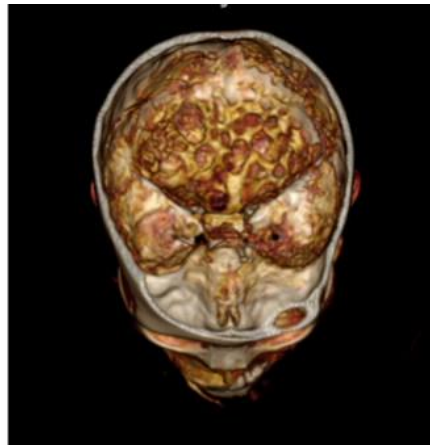


Fig 2a

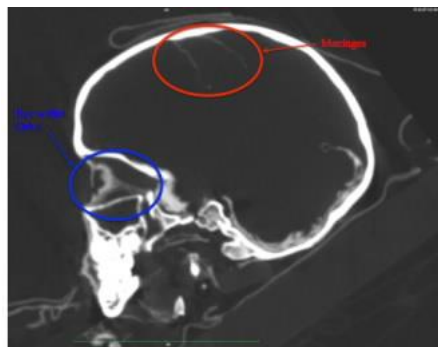


Fig 2b

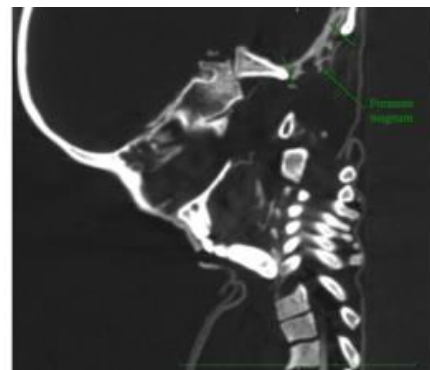


Fig 2c



Fig 2d



Fig 3a

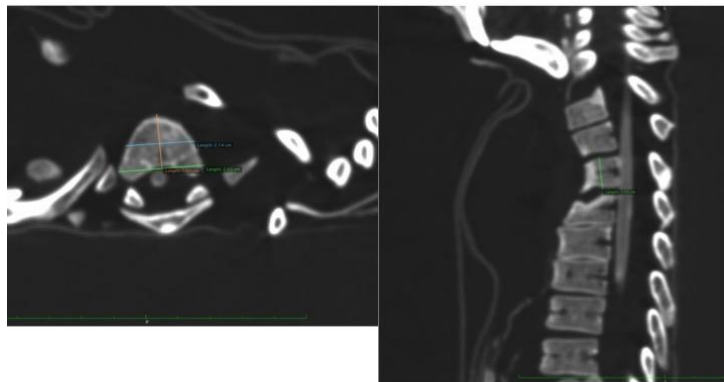


Fig 3b

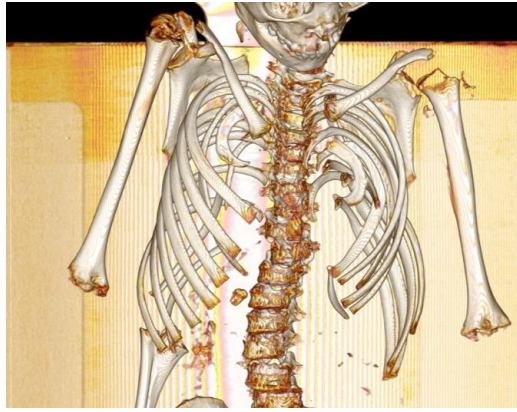


Fig 3c

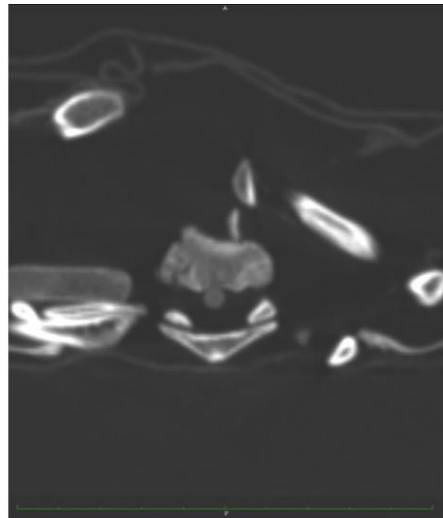


Fig 3d

### Figure captions

**Figure 1-** **a.** Child mummy PQ 31 was buried wearing a brown sheep wool Franciscan cassock and monastic cloak; **b.** Wide subpubic angle; **c.** Age at death can be placed between 7- and 8 -years –old (the central incisors had erupted but the lateral incisors had not); **d.** the overall state of preservation of the body is poor and has resulted in an almost complete skeletisation.

**Figure 2-** **a.** Desiccated cerebral material; **b.** Remnants of meninges and retained eye globes; **c & d.** A wooden “rod” inserted in the spinal canal and disruption of C2&3;

**Figure 3-** **a.** Thoracic spinal deformity; **b.** Spinal deformity caused by pressure ANTERIOR to the vertebrae; **c.** Ribs without “notching”; **d.** Anterior spinal body deformity.