

The Giant of Extremadura: acromegalic gigantism in the 19th century

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ABSTRACT

Introduction. Exhibited in the Spanish National Museum of Anthropology (MNA, for its Spanish initials) in Madrid are the skeleton and a plaster cast of the cadaver of Agustín Luengo Capilla (1849-1875), known as the *Gigante Extremeño* (“the Giant of Extremadura”), whose study may provide data of social and epidemiological interest.

Aims. To investigate Luengo’s life and to reflect on diseases he may have presented in life, based on the MNA exhibition.

Results. Luengo travelled to Madrid in 1875, apparently to be treated by the renowned surgeon and anatomist Pedro González Velasco (1815-1882). He was granted an audience with King Alfonso XII (1857-1885), who in all likelihood presented him with a pair of custom-made boots, which he never had the opportunity to wear. Unlike other cases of gigantism, Luengo’s cadaver was voluntarily donated to González Velasco by his mother. Inspection of the skeleton and plaster cast reveal underdeveloped genitalia, hypertrophic osteoarthropathy, and exterior drainage of an abscess of probable bone origin.

Discussion. In addition to the cast of his body, the skeleton of the Giant of Extremadura is currently (2018) the only specimen in the world that is freely accessible to the general public. Study of his DNA and comparison to the skeletons of two giants kept at the anatomical museum of the Madrid Faculty of Medicine may assist in detecting carriers of genes associated with acromegaly, gigantism, and prolactinomas in the region of Luengo’s birth.

KEYWORDS

Agustín Luengo Capilla, Giant of Extremadura, acromegalic gigantism, Museo Nacional de Antropología

Introduction

Pituitary gigantism and acromegaly are chronic multisystemic diseases most frequently caused by monoclonal expansion of cells secreting growth hormone (GH) and insulin-like growth factor 1 (IGF-1), generally due to anterior pituitary adenomas and rarely due to hypertrophy of the gland.¹ GH and IGF-1 overproduction with onset in adulthood causes acromegaly, with dysmorphic changes to the face, bone growth in the hands and feet, soft tissue hypertrophy,

generalised organomegaly, arterial hypertension, and peripheral insulin resistance.²

If hypersecretion of these factors occurs prior to epiphyseal fusion, patients display fast, linear, excessive growth at the expense of the metaphyseal plates, generally associated with acromegalic features. In one subgroup of patients with acromegaly, gigantism, or prolactinoma, the process is caused by mutations to the *AIP* gene or to X-linked genes (eg, *GPR101*).³ Pituitary gigantism should be distinguished from so-called syndromic gigantism⁴⁻⁷ and from excessive growth and tall stature for their

percentile in their age group in children and adolescents not presenting altered GH or IGF-1 secretion.⁸

On 16 October 1876, Dr Pedro González Velasco (1815-1882), a famous surgeon and enthusiastic anatomist, presented before the Spanish Anatomical Society the plaster cast of a 26-year-old man measuring a not inconsiderable 2.32 metres in height.^a The cast, representing Agustín Luengo Capilla (Puebla de Alcocer, Badajoz, 15 August 1849-Madrid, 31 December 1875), was covered with Luengo's own skin and the outlandish costume he wore to exhibit himself with travelling circuses; the model had the dubious honour of occupying the central hall of the Spanish National Museum of Anthropology (MNA, for its Spanish initials), of which Velasco was proprietor. From 1877, Luengo became known as *el Gigante Extremeño* ("the Giant of Extremadura").^b

Individuals with acromegalic gigantism have provoked irresistible fascination in societies throughout history. In the 18th and 19th centuries, these individuals would often forge a lifestyle of their surprising height, exhibiting themselves in elegant salons, fairgrounds, and travelling circuses. After they died, many fell victim to anatomists' eagerness to acquire their cadavers, often through illicit means, with the shady intention of displaying their impressive skeletons in anatomical museums. In Europe, this fate befell the famous Irish giants Charles Byrne (1761-1783)⁹ and Patrick Cotter (1760-1806)¹⁰; more recently, the international cases of Joseph Édouard Beaupré (1881-1904)¹¹ and the Giant of Montastruc¹² should be noted.

The story of Agustín Luengo has been mentioned only in the tabloid press,^{13,14} novels of undeniable originality,¹⁵ and in myths circulating about his life, such as the alleged purchase of his skeleton by González Velasco.¹⁶ His skeleton, perhaps the most admired object in the Origins Room at the MNA, has never been the object of scientific examination. With these limitations, the present study aims to establish the Giant of Extremadura's place in the history of acromegalic gigantism and to suggest possible insights that may be gained from examination of the skeleton.

Material and methods

Information for this article was obtained through visits to museums and other sites preserving the skeleton and belongings of the *Gigante Extremeño* and the skeletons of other individuals with gigantism. The MNA in Madrid (Origins Room) houses both Agustín Luengo's skeleton and a plaster cast of his cadaver. The Ethnographic Museum of Puebla de Alcocer (Badajoz, Spain) displays a naïve circus poster advertising the Giant of Extremadura, and one of his boots. The Javier Puerta anatomical museum of the Universidad Complutense de Madrid holds two skeletons of individuals with gigantism (a French grenadier, and another labelled "*gigante extremeño*"). Finally, the author had the opportunity to visit the skeleton of "The Irish Giant" Charles Byrne at the Hunterian Museum at the Royal College of Surgeons in London (closed to the public as of January 2019).

Part of the limited information available on Agustín Luengo is drawn from short reviews in the daily press (published between 1875 and 1876), accessible through the National Library of Spain's digital press archive. It was not possible to locate his baptism certificate or other documents in his hometown, as they were destroyed in a fire at the archives in 1936. Luengo's death certificate was obtained at the General Archive of Notarial Records in Madrid. *Anfiteatro Anatómico Español* (1873-1880), the official publication of Madrid's Free School of Medicine in the Sexenio Revolucionario period (1869-1874), includes contributions from Pedro González Velasco (the journal's director), among them a report that Josefa Capilla, Agustín's mother, had donated his cadaver and autopsy findings, as well as the presentation of these at the International Exposition of 1867 in Paris.¹⁷ The life and work of Pedro González Velasco, the founder of Spanish anthropology, were consulted in *El doctor Velasco: leyenda y realidad en el Madrid decimonónico* (Dr Velasco: legend and reality in nineteenth-century Madrid).¹⁸

The history of acromegaly and gigantism was researched in original¹⁹⁻²⁷ and review articles.²⁸⁻³¹ Documentation was located on famous individuals with gigantism (eg, the Giant of Altzo),^{32,33} as well as monographs on the Irish giants Charles Byrne⁹ and Patrick Cotter¹⁰ and other historic giants whose skeletons were conserved at any point.

^a *Diario Oficial de Avisos*, 1876.

^b *La Correspondencia de España*, Monday 19 March 1877.



Figure 1. Ethnographic Museum of Puebla de Alcocer. A) “The king of the European giants. I am Spanish,” reads the enormous circus poster showing Agustín Luengo beside a person of smaller stature (donated by a local resident to replace the painting that was shown around the year 2000). B) Comparison of a boot belonging to Luengo with the author’s shoe. C) The condition of the sole of the boot shows that it was never worn.

Finally, the study addresses the potential relevance of performing certain genetic studies on the remains of the Giant of Extremadura, and the recent ethical and medico-legal controversy regarding the conservation of human remains in museums and laboratories.

Results

An overview of the life and death of Agustín Luengo Capilla

Luengo’s hometown of Puebla de Alcocer in La Siberia, Extremadura (so named for its remote location), was not an obscure place: in *Don Quixote*, among the duke of Béjar’s many titles, Cervantes (1547-1616) mentions the Viscounty of Puebla de Alcozer (sic). Following the

battle of Las Navas de Tolosa (16 July 1212), the village came under the administration of the Archbishop of Toledo, and then the Gutierre de Sotomayor family.³⁴ In school, Agustín Luengo would have learned little more than some reading and a great many prayers, in line with education in the region in the mid-19th century.³⁵ Like other individuals with acromegalic gigantism, he was destined to support himself by appearing as an attraction with a travelling circus. The Ethnographic Museum of Puebla de Alcocer exhibits a naïve poster (a copy of the original owned by a local resident) bearing witness to this fact, as well as one of Luengo’s boots, which he never had the opportunity to use (Figure 1). The population of the village (currently 1249) has remained stable over time.



Figure 2. The only known photograph of the Giant of Extremadura shows him in his “professional” clothes, standing beside his mother Josefa Capilla, shown in typical peasant dress. The elegant young man to the right contrasts greatly with the pair. To date, no document has surfaced corroborating that the man is the young king Alfonso XII, although he bears a strong resemblance.

Relationship with King Alfonso XII: a historic image

The *Gigante Extremeño* exhibition in Puebla de Alcocer includes a deteriorated old photograph which merits analysis (Figure 2). The image shows Luengo’s mother Josefa Capilla in humble peasant dress. To her left stands Agustín, wearing his circus costume; his big toe can be seen protruding from the tip of his right shoe (arrow). In the background, we can observe what may be the entrance to a circus tent. The elegant dress of the young man on the right-hand side contrasts sharply from the clothing of the mother and son. Although no documentation confirms this assertion, the man may be King Alfonso XII (1857-1885), then an adolescent: another photograph of the king shows the same “Napoleonic pose,” an identical suit, and a very similar facial expression. Luengo was granted an audience with the king on 2 October 1875.³ Given the historical context, one cannot help but be surprised by this fact (the Palace’s General Archive does not record the meeting): the young king had only months

earlier arrived in Barcelona (9 January 1875) from Royal Military Academy Sandhurst (England), and Spain was still immersed in the Carlist Wars.³⁶

Why might a royal audience be granted to a poor man whose only merit was exhibiting his unusual anatomy in a ridiculous costume? The answer may lie in his magnificent boots, custom made to fit his colossal feet (a descendant of the family recently donated the second boot, which was missing). Such footwear would have been beyond Luengo’s economic reach; perhaps the king was surprised to see the condition of his shoes when he took the photograph with the giant and his mother at the entrance to a circus, of which the young king was an enthusiast. Agustín never had an opportunity to wear the boots, as he died less than three months later. Josefa Capilla brought her son’s boots when she returned, distraught, to Puebla de Alcocer, and they ended up in the local museum.

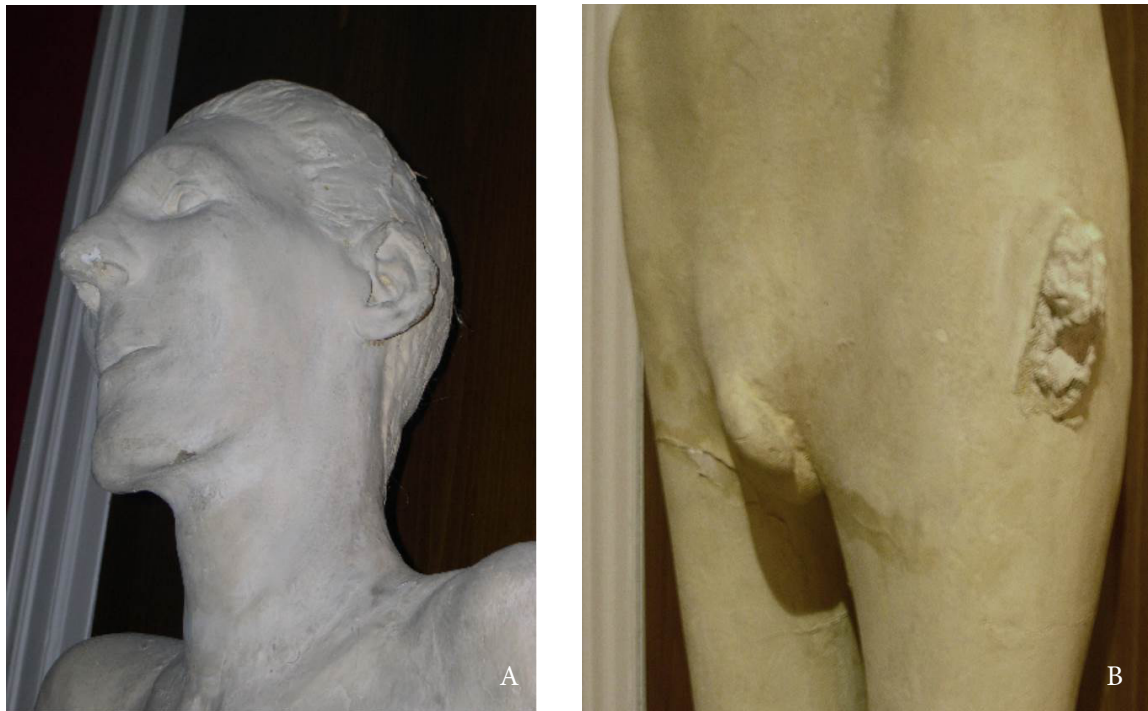


Figure 3. A) *Vaciado* or cast of Agustín Luengo's body. In addition to the prominent mandible and the broad supraorbital ridge, the face is striking for its peaceful expression. B) Besides the underdeveloped genitalia, the cast is noteworthy for the large, thick-bordered, oval-shaped lesion, granular in texture, which Velasco decided not to conceal.

The story told by the cast of Luengo's cadaver

When he arrived in Madrid in late August 1875, Agustín Luengo was severely ill, with only four months to live^{c,d}. Why, in his condition, might he have made such a long journey from his native Extremadura? On the plaster cast made from his cadaver (Figure 3A), exhibited at the MNA, a vertical oval of approximately 5×4 cm can be seen beside the left hip joint. The edges of the lesion protrude slightly, and the surface has an anfractuous appearance. This clearly corresponds to a substantial skin lesion present at the time of his death, which Dr Velasco did not attempt to conceal on his excellent cast of the body. A descendant of the surgeon recalls stories, passed down through the generations of her family, about “the *Gigante Extremeño*’s frequent visits to receive certain treatments from Dr Velasco” (Concepción López Sebastián, personal correspondence). Velasco was a renowned physician at the time, and received patients

from across the country.^{37,38} It is not a leap to deduce that the unfortunate giant should visit Madrid, perhaps travelling with the circus, to receive treatment on what may have been an abscess opening near the left hip. At the time of his death, Agustín's face (Figure 3B) shows a remarkable serenity, despite the indignities and suffering of his life as a circus attraction: his face is balanced, even with his large chin and prominent cheekbones.

Vaciado, Velasco's term, is defined as “the shape of an object after molten material is poured into a hollow metal mould.” Ironically, Velasco's sole contribution to the field of anatomy was born from chance. Under the gaslights of Café del Iris, in a narrow street between Calle Alcalá and Calle San Jerónimo in Madrid, a travelling salesman taught him the technique: by closely applying a thick layer of warm gelatin to the surface of the piece to be reproduced, then allowing it to cool and set, a more or less rigid mould can be obtained which can be filled with a thin emulsion of plaster. Once this solidifies, the gelatin can be removed and the cast realistically painted. This discovery earned Velasco an honourable mention

^c Diccionario de la lengua española, 22nd edition. RAE, 2001.

^d *El Restaurador Farmacéutico*.1963;19:40.

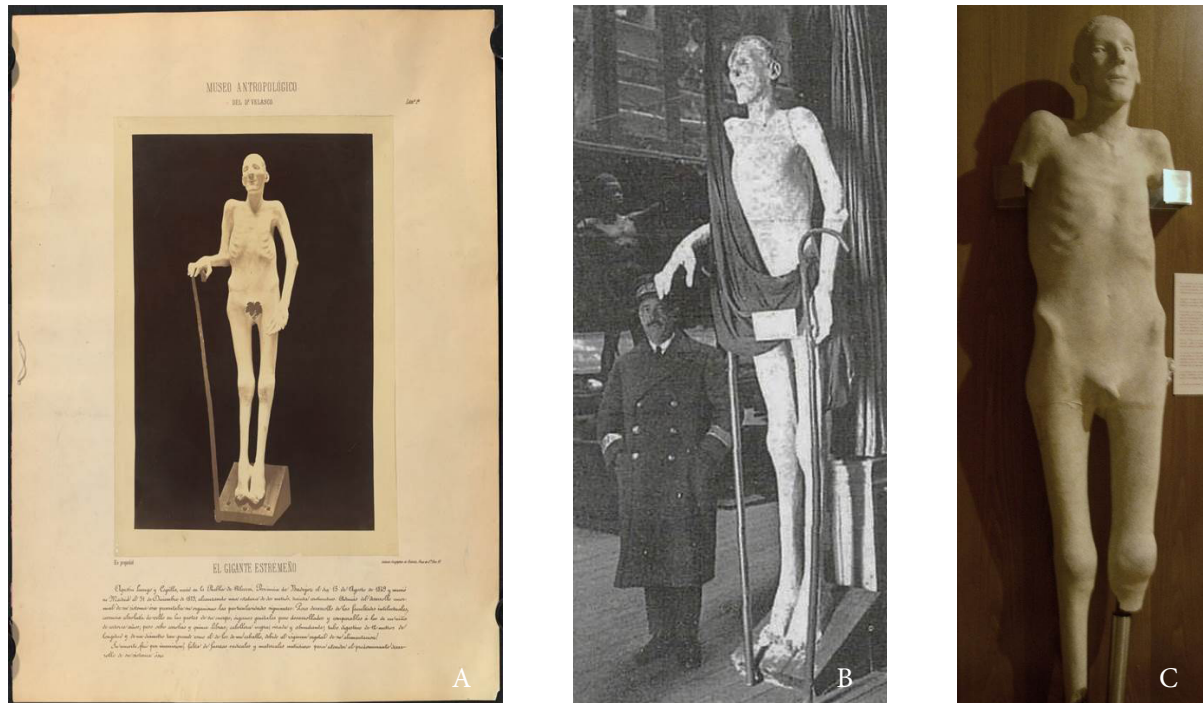


Figure 4. Damage inflicted upon the cast of the *Gigante Extremeño* over time. A) The cast in 1876, shown without the skin and the circus costume, with the right arm extended to rest upon Luengo's substantial cane. B) In 1935: the arm can be seen bending downward. C) The cast in its current condition, with the right arm amputated below the shoulder; the left leg has also been removed below the bulging knee.

at the 1867 International Exposition in Paris. At the Spanish Royal National Academy of Medicine, the level of perfection reached by Velasco is demonstrated in the reproduction he made of the Academy's Chair, Juan Drumén y Millet (1798-1863).^c

Luengo's cast was covered with his own skin and clothing; this cannot have lasted long, as the museum catalogue from 1876 shows him nude (Figure 4A). With time, the right arm began to bend downwards, and was eventually separated from the body, along with part of the left leg, perhaps in the bombing of 16 November 1936 (Figures 4B and C)³⁹; the cast remains in this condition today.

Donation of the *Gigante Extremeño*'s cadaver

Agustín Luengo died at 6 pm on 31 December 1875 at the Parador de Cádiz, an inn located at number 125, Calle Toledo, Madrid, the starting point of the road south to Andalusia. He died among clamour, goods carts, and mule trains. His precise age was 26 years, 5 months,

and 15 days. Luengo's death certificate (Figure 5) states that the cadaver "was delivered to Dr Pedro González Velasco, to be taken to the museum of anthropology of which he is proprietor."⁶ The death certificate is signed by two humble witnesses to Luengo's death (and possibly also of the donation of his body to science), a cobbler and a day labourer.⁶ The anatomist clearly explains the circumstances: "This young man's body was transported to the Museum with the approval of his inconsolable mother, who has expressed her desire that it be used for anatomical study, and with the approval of the competent authorities."⁶ In other words, the cadaver was not bought or stolen, but donated.

The autopsy

The cast was probably part of the original museum catalogue, published in 1876, of which the remaining pages are lost. The caption to the photograph shown in Figure 4A succinctly describes the findings from Agustín Luengo's autopsy:

^c *El Anfiteatro Anatómico Español*. 1876;73:29.

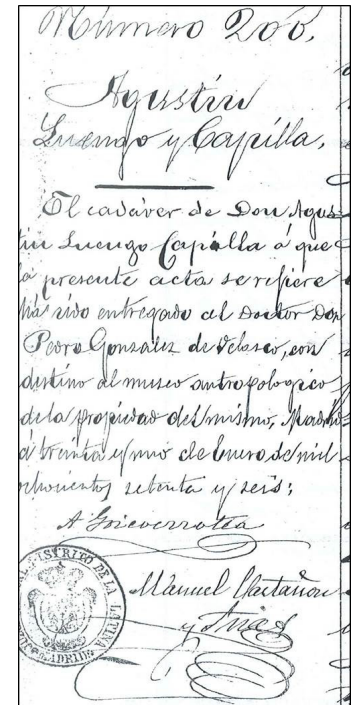


Figure 5. The southern façade of the Puerta de Toledo, the starting point of the road to Andalusia, in 1865 (photograph by J. Laurent). Beyond the gate, to the right, is the Parador de Cádiz, where Agustín Luengo died. The fragment of his death certificate reads: “The body of Agustín Luengo Capilla, subject of the present certificate, was delivered to Dr Pedro González Velasco, to be taken to the museum of anthropology of which he is proprietor. Certificate issued in Madrid on the first of January 1876.”

In addition to the abnormal bone development, the body presents the following characteristics: poor development of the intellectual faculties; total lack of hair on parts of the body; poor development of the genital organs, which are comparable to those of a boy of 14 years; weight of eight *arrobas* and fifteen pounds; abundant, curly, black hair; digestive system 12 metres in length, with a similar diameter to that of a horse's, due to his plant-based diet. Death was caused by starvation and a lack of radical forces and nutritional material to meet the excessive development of his skeletal system.

A simpler or more naïve post mortem report is difficult to imagine. “An eminent anatomist, incomparable dissector, surgeon of great and deserved fame, and a model professor for his love of teaching and youth,” reads Velasco’s headstone at the MNA, written by Ángel Pulido.⁴⁰ He may have been an excellent anatomist, but he was far from being a pathologist. This practised surgeon, so dedicated to his patients, was in fact more interested in the physical appearance of his dissections than in their scientific significance: after long years

travelling from convent to convent and serving as an army volunteer, he was qualified for little more. The 8000 “open” bodies he boasted of were soon and perhaps thanklessly forgotten,⁴¹ and made little contribution to science. Velasco would have coveted the giants exhibited in the museums of Paris and London; satisfied to have acquired his own, he investigated no further. He did not even examine the cranial cavity.

Discussion

The remains of the Giant of Extremadura are unique for three reasons. Firstly, the cadaver was donated by his mother, rather than bought or stolen. Second, the excellent cast made of the cadaver: the anatomist Juan Fourquet y Muñoz (1807-1865) described Velasco’s casts as “true daguerreotypes” (primitive photographs developed on a silver plate).⁴² Finally, this skeleton and those held at the Javier Puerta anatomical museum in Madrid are the only specimens in Europe available for public visits (as of January 2019).

Cadavers: donated or stolen?

From the time of its inauguration on 29 April 1875 by king Alfonso XII, the MNA came to be known as the “house of horrors.” The general public could not comprehend the exhibition of monstrous fetuses, pestilent mummies, and corroded bones. Despite this, Josefa Capilla was willing to donate her son’s body to Dr González Velasco; this was her way to repay the good doctor for his concern. The donation of the *Gigante Extremeño*’s cadaver is highly unusual, given the history of other cases of acromegalic gigantism.⁴³

The theft of bodies by so-called “resurrectionists” to supply the dissection tables of some surgeons was a lucrative trade in the United Kingdom in the 17th and 18th centuries, when the gallows no longer provided sufficient cadavers (50 individuals were hanged in London in 1748).⁹ The Anatomy Act 1832 put a stop to these shady dealings. The bodies of individuals with gigantism were highly sought after by physicians wishing to enrich their private anatomy museums with unusual specimens, far overstepping ethical lines.⁴³

The short-tempered John Hunter (1728-1793) and the wilful Pedro González Velasco had much in common: both grew up in large peasant families with limited resources, had little talent for writing, and were skilled anatomists and prosperous surgeons. They were also compulsive collectors, owning their own museums.^{9,18} Furthermore, both men’s collections narrowly escaped destruction: in London, after an air raid on the night of 10 May 1941, and in Madrid, between 7 and 8 pm on 16 November 1936, when Junkers bombers of the German Condor Legion dropped incendiary bombs along Paseo del Prado, damaging the Prado museum and the MNA, among other distinguished buildings.³⁹

The English journalist and historian Wendy Moore researched the ploys by which John Hunter came into possession of the body of the giant Charles Byrne (also known by his stage name, O’Brien) for her book *The knife man*.⁹ Terrified of falling into the collector’s hands, Byrne had taken precautions to avoid this fate, ordering the construction of an enormous, heavy coffin in which he would be buried at sea. Byrne died at the age of 22 on Sunday 1 June 1783, guarded by trusted friends. The cheery procession moved from pub to pub on their way to the sea, when the cunning Hunter, after forking out 5000 pounds (a colossal amount at the time), hired an undertaker and his accomplices to extract Byrne’s body

and replace it with paving slabs. Nobody realised the switch had been made. John Hunter boiled the giant’s remains in a great copper vat, but four years would pass before he dared exhibit the skeleton at his museum on Leicester Square. His technique for removing flesh from the skeleton was rather different from the particular method used by Velasco, who “would tenderise skeletons in warm manure; I cannot recall anybody else using this method; it made the bones look like ivory,” recalls his loyal student Ángel Pulido.⁴⁰

The fate of the skeleton of the other Irish giant, Patrick Cotter (1760-1806), is documented by the University of Bristol anthropologist Jonathan H. Musgrave, who studied his remains in 1972.¹⁰ Word reached Cotter of the indignities inflicted upon Byrne’s remains in London, and he took precautions: he ordered a leaden coffin encased in wood, to be buried in a grave cut 12 feet (3.6 metres) deep in solid rock. He was exhumed in 1906 for examination of the body, which included a radiography of the sella turcica. Until 1972, Cotter’s deteriorating remains were exhibited and inhumed on five occasions. Now very deteriorated, they are not available for public viewing.

Cornelius Magrath (1736-1760) was transported to the dissection room at Trinity College Dublin (Republic of Ireland) after his death, in unclear circumstances.⁴⁴ His skeleton is housed in the old building of the college’s Anatomy Museum, but is not currently on display.

The embalmed cadaver of the Canadian Édouard Beupré (1881-1904) was exhibited for money at a funeral home in Montreal; his family were unable to pay for him to be buried. His body was subsequently conserved for 85 years at the anatomy department of the University of Montreal, and was eventually claimed by two descendants of his family, and cremated on 7 July 1990. Beupré’s ashes were taken to the place of his birth, in Willow Bunch, Saskatchewan (Canada), where a sculpture was installed in his memory.^{11,43}

Due to the extreme fragility of the bones, the anatomist W. Hutchinson was unsuccessful in his attempt to assemble the skeleton of the giantess Lady Aama for exhibition at his anatomy department in Iowa (USA). Finally, the American Harvey W. Cushing (1869-1939), a pioneer of neurosurgery and the study of the pituitary gland’s role in certain endocrine syndromes,⁴⁵ paid out 50 dollars to unlawfully acquire the body of the giant John Turner (1874-1911) (case XXXII in his monograph) during his

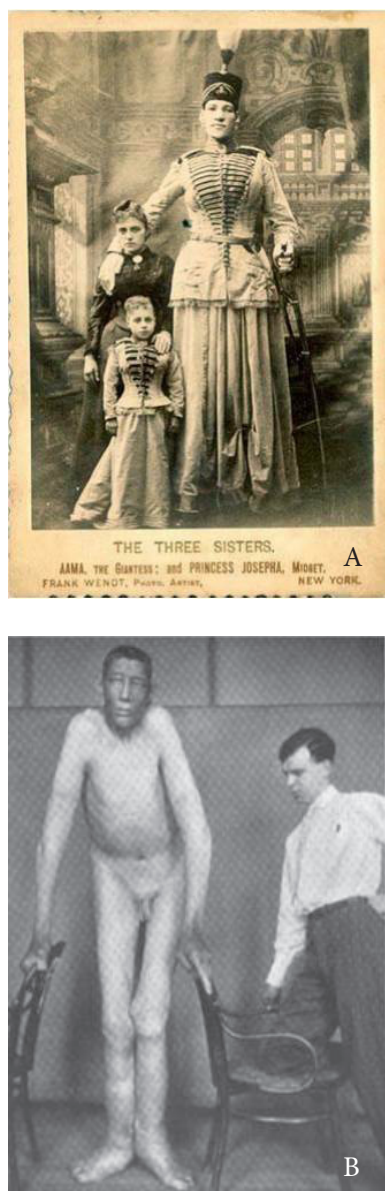


Figure 6. A) The French giantess Lady Aama (Emma Alline Battaid), photographed with her sister and a dwarfess; her autopsy revealed enlargement of the pituitary gland.^{26,27} B) Case XXXII from Cushing's monograph⁴⁵; an unauthorised autopsy was performed in order to investigate the condition of the pituitary gland.

funeral, enabling him to examine the pituitary gland (Figure 6A and B).⁴⁶ These cases, at the turn of the 20th century, probably represent the last attempts to illegally procure the cadaver of a giant.

The cast of Agustín Luengo's body

No other museum in the world has the privilege of

exhibiting an anatomical cast taken from the fresh cadaver of a patient with gigantism, as is the case of Agustín Luengo. The only exception known to the author is a cast of the hand of Patrick Cotter, which is exhibited beside a glove at Blaise Castle House Museum in Bristol (United Kingdom).¹⁰

In addition to the skin ulceration at the level of the trochanter (shown in Figure 3A), close inspection of the cast offers insight into health conditions that Luengo may have suffered in life. His underdeveloped genitalia, which Velasco compares to those of a 14-year-old boy, are probably explained by hypergonadotropic hypogonadism associated with destruction of the pituitary gland due to the suspected adenoma.⁴⁷ The autopsy report of Lady Aama compares the uterus to the distal phalanx of the little finger and notes that "vagina [...] barely admit[s] the forefinger"; however, the clitoris was extremely prominent, measuring half an inch (1.27 cm) in length. The considerable bulging of Agustín Luengo's knees, particularly affecting the left side, is consistent with the proliferation of bone, cartilage, and periarticular tissues associated with the anabolic function of GH and IGF-1, and would explain his difficulty walking (he always went accompanied by a huge cane, even as an assembled skeleton, exhibited in a standing position).⁴⁸

The skeleton

The skeleton of the Giant of Extremadura is now exhibited recumbent behind a glass screen. This was not always the case: a month after the inauguration of the MNA, the journalist Miguel Martínez Ginesta notes that "facing the door stands a colossal human skeleton" (Figure 7).⁶ The support collapsed at some point and the assembly came apart. The cranium shows clear signs of acromegaly, as described by Pierre Marie (Figure 8A)^{23,24}: the marked prominence of the superciliary arches, the expansion of the zygomatic bones, the broad aperture of the nasal fossae, and the disproportionately large mandible. The skeleton presents striking metaphyses (the intermediate section of long bones, composed of cartilage in very young individuals), which would have allowed Agustín to continue growing at the age of 26 (Figure 8B). The abnormal bone growth around the knees, and the irregular relief, darker in colour than the surrounding bone, is probably caused by hypervascularisation. The cancellous bone of the femoral head is collapsed bilaterally, with the acetabulum surrounded by a thick border of neoformed bone. With the Hunterian Museum



Figure 7. The MNA's Great Central Hall in 1882. The Giant of Extremadura is shown facing the entrance, protected in a glass display cabinet (arrow).

of London closed for building work and the skeleton of Cornelius Magrath not exhibited for public viewing, the Giant of Extremadura and the two skeletons of individuals with gigantism at the Faculty of Medicine in Madrid are currently the only specimens on display in Europe.

Agustín Luengo's place in the history of acromegalic gigantism

Understanding of the history of acromegaly and pituitary gigantism in the latter part of the 19th century requires three key concepts. 1) The endocrine system and its function were not known at the time^{49,50}: the pituitary gland was believed to be a vestigial organ, with the anterior lobe related to the digestive system and the posterior lobe to the ependymal canal.²⁵ 2) Nosologically, acromegaly and gigantism were considered separate processes; neurologists were very

interested in both as they were considered forms of "nervous system dystrophy," displaying abnormalities comparable to the *tabes dorsalis* deformities observed in Charcot arthropathy and syringomyelia.^{12,23,24} 3) Besides anecdotal accounts, such as the Dutch physician Johannes Wier's (1515?-1588) observation in 1567 of a young woman who exhibited "her gigantic size" in a travelling show,³² physicians did observe in at least three reports subsequent to the *Gigante Extremeño*^{12,25,26} an association between gigantism, acromegalic features, and increased size of the pituitary gland in autopsy studies. The difficulty was in interpreting this finding. Due to failings in the autopsy, Dana²⁵ declined to discuss this relationship in his first patient, a native of Bolivia who exhibited himself in New York. The neurologists Brissaud and Meige¹² inaccurately suggested that the enlarged pituitary gland was an effect, rather than the cause, of gigantism. Only Hutchinson's^{26,27} explanation

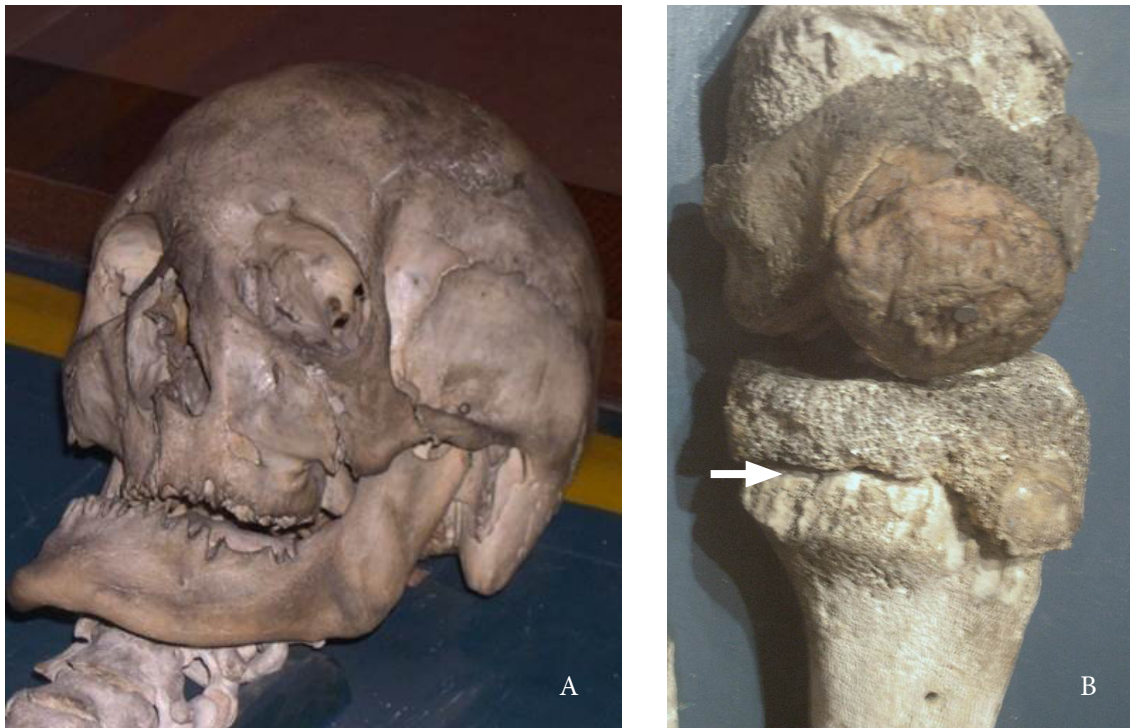


Figure 8. A) Cranium of the Giant of Extremadura, showing prominent supraorbital arches, broad nasal fossae, abnormal development of the zygomatic bones, and apophysis of the mastoid process and mandible. B) The metaphyseal line (arrow) is permeable in the proximal part of the left tibia. Abnormal growth can clearly be observed on the periarticular bone, which has a spongy appearance and reddish colouring.

approaches the modern understanding of the condition: he proposes that the giantess Lady Aama represents a case of acromegaly with onset during fetal life or childhood.

Neither Hunter nor Velasco took the time to open the cranial cavity of their respective specimens. As a result, they may have missed the opportunity to be the first to demonstrate pituitary adenoma; however, this was not their interest: they were content simply to display the cadavers in their respective anatomical collections. Unlike Hunter, who concealed Byrne's skeleton for several years, Velasco rushed to present the cast he made of his patient before the Spanish Anatomical Society in 1876. This is thought to be the first scientific presentation in the history of gigantism.

Future lines of research

As mentioned above, Velasco had not the least scientific interest after acquiring the body of Agustín Luengo and

performing a cursory examination of the digestive tract; it was simply another specimen to rouse the curiosity of visitors to his museum. And so it continues to be. In any case, this is a reflection of the concept of the anatomical museum in the 19th century, standing on the frontier between scientific collecting and public spectacle through the exhibition of exotic or unusual specimens.⁵¹ This is not the function of modern museums, which are committed to research as well as to the growth, custody, and preservation of their collections.

The story of Charles Byrne's skeleton is somewhat different. The cranium was opened in 1911 by the American neurosurgeon Harvey W. Cushing, who suspected that Byrne may have had a pituitary tumour⁵²; radiological examination confirmed the destruction of the sella turcica.⁵³ A further study demonstrated the lack of ossification of the metaphyseal lines of the radius, suggesting that had he not died due to alcoholism at the



Figure 9. Javier Puerta anatomical museum, Faculty of Medicine, Universidad Complutense de Madrid. A) The skeleton of an individual with gigantism, labelled “*gigante extremeño*,” exhibited beside reproductions of normal-sized human bodies. B) The skeleton of the “French grenadier” is displayed in the opposite corner of the room.

age of 22, Byrne would have continued growing.⁵⁴ The crania of Patrick Cotter¹⁰ and Édouard Beaupré¹¹ have also been examined in radiographic studies.

The renowned Irish giant Charles Byrne, born in the district of Mid Ulster in Northern Ireland, continues to be a subject of cutting-edge research. The DNA obtained following the extraction of two teeth identified a mutation (R304) in the *AIP* gene; the remains of Cornelius Magrath (born on the southern coast of Ireland) do not present this mutation. In four contemporary Northern Irish families, some members presenting acromegaly, gigantism, or prolactinoma have been shown to carry the same mutation and haplotype. Essentially, the mutant gene has been transmitted from one generation to the next for 250 years in a highly geographically restricted population.^{55,56} Based on these results, genetic screening for the R304 mutation could be performed in the population of Mid Ulster, facilitating early diagnosis

of the relatively few cases of prolactinomas, as well as potential cases of pituitary gigantism and acromegaly.³ Genetic testing of the skeleton of Agustín Luengo and those exhibited at the anatomical museum in Madrid would enable screening for any mutations detected in the relatively stable populations of La Siberia, La Serena, and Vegas Altas in the province of Badajoz.

Setting aside myths and legends, other cases of gigantism have been recorded in Spain. Among the 346 tombs excavated at a 7th-12th century Jewish necropolis in Lucena (Córdoba), skeletal remains were found of a possible case of acromegalic gigantism.⁵⁷ Due to protest from the Federation of Jewish Communities of Spain, the remains had to be buried once more. Joaquín Eleizegui Arteaga (1818-1861), the Giant of Altzo, was born in the hamlet of Ipinza in Altzo Azpi, near Tolosa (Guipúzcoa), and had the honour of being considered the tallest man in Spain in his day, in addition to being the inspiration

for the recent film *Handia* (Giant). When an attempt was made to exhume his remains, they were found to have disappeared. The Zumalakárregi museum in San Sebastián conserves several of his belongings, although his bones have not to date been located.^{32,33}

Finally, exhibited at the Jesús Puerta anatomical museum in Madrid are the skeletons of two more giants (Figure 9), known simply as the French Grenadier and the “*gigante de Extremadura*”; no documentation is available regarding their provenance (Dr Fermín Viejo, personal correspondence). However, in 1875, Dr Ángel Pulido Fernández recorded in writing some details on the Anatomic Museum of the San Carlos Faculty of Medicine, directed at the time by Florencio de Castro y Latorre, Chair of Anatomical Technique and another dedicated follower of Velasco’s. Among the curiosities held at the museum, he cites:

An old skeleton of a French sapper, noteworthy for its remarkable stature and *another* of an individual who abused mercury during his life; when his bones were drilled to articulate them, the metal escaped from the hole; the mercury is conserved in a jar beside the skeleton [emphasis added].⁵⁸

The famous jar has since disappeared, but it is evident that at the time of Agustín Luengo’s death on 31 December 1875, there were already two skeletons of individuals with gigantism in Madrid. Presumably, one of these was at some point erroneously labelled the “*gigante extremeño*.”

The future of Agustín Luengo’s skeleton may be compromised since the publication of a provocative article (Should the skeleton of the “Irish Giant” be buried at sea?) in the British Medical Journal, raising ethical and medico-legal questions about the exhibition of Charles Byrne’s skeleton.⁵⁹ This is no small problem: the Museum of London alone holds 17 000 skeletons from excavations in the city.⁶⁰ In a survey, 91% of participants were in favour of the exhibition of human remains in museums, given they may be important to future research.⁶¹ This has not always been the case: the grandchildren of two Norwegian Sami people, whose crania were held at the University of Oslo’s Anatomy Department, demanded that they be buried; after heated discussion, they were eventually successful.⁶² The same happened in Lucena, in this case for religious reasons.⁵⁷

The *Gigante Extremeño* is one of the earliest medical observations of a case of acromegalic gigantism. In addition to his personal belongings, his skeleton and

a surprisingly realistic cast of his body are conserved; the latter offers insight into associated conditions he may have experienced in life. The possibility of early diagnosis of acromegalic gigantism and the effectiveness of the treatments now available make it unlikely that we should see any cases as severe as Agustín Luengo’s in the future; this adds to the interest of the patient. In the absence of formal scientific research, the usefulness of which can only be conjectured, a study of Luengo’s DNA and its comparison to that of the other two skeletons held in Madrid before 1875 may be of assistance in the early detection of carriers of genes involved in acromegaly, gigantism, and prolactinoma in the region where he was born.

Acknowledgements

I am grateful to Vanessa Cisteré of the Spanish Society of Neurology’s Museo Archivo Histórico for her assistance in accessing historical articles. Dr F. Morales Asín kindly translated the article by N. Friedreich from the original German. Pablo Ruíz Sánchez (Puebla de Alcocer, Badajoz) provided Agustín Luengo’s death certificate and the photograph of king Alfonso XII.

Conflicts of interest

The author has no conflicts of interest to declare.

References

1. Horvath E, Kovacs K. Pathology of acromegaly. *Neuroendocrinology*. 2006;83:161-5.
2. Vilar L, Vilar CF, Lyra R, Lyra R, Naves LA. Acromegaly: clinical features at diagnosis. *Pituitary*. 2017;20:22-32.
3. Rostomyan L, Potorac I, Beckers P, Daly AF, Beckers A. AIP mutations and gigantism. *Ann Endocrinol (Paris)*. 2017;78:123-30.
4. Sotos JF, Dodge PR, Muirhead D, Crawford JD, Talbot NB. Cerebral gigantism in childhood. A syndrome of excessively rapid growth and acromegalic features and a nonprogressive neurologic disorder. *N Eng J Med*. 1964;271:109-16.
5. Correa R, Salpea P, Stratakis C. Carney complex: an update. *Eur J Endocrinol*. 2015;173:M85-97.
6. Pappas JG. The clinical course of an overgrowth syndrome, from diagnosis in infancy through adulthood: the case of Beckwith-Wiedemann syndrome. *Curr Probl Pediatr Adolesc Health Care*. 2015;45:112-7.
7. Blumberg DL, Sklar CA, David R, Rothenberg S, Bell J. Acromegaly in an infant. *Pediatrics*. 1989;83:998-1002.
8. Coutant R, Donzeau A, Decrey A, Louvigné M, Bouhours-Nouet N. How to investigate a child with excessive growth. *Ann Endocrinol (Paris)*. 2017;78:98-103.
9. Moore W. The knife man: the extraordinary life and times

- of John Hunter, father of modern surgery. New York: Broadway Books; 2005.
10. Frankcom G, Musgrave JH. The Irish giant. London: Duckworth; 1976.
 11. Blais JM. Edouard Beaupré, 1881-1904. *Can Med Assoc J*. 1967;96:1647-53.
 12. Brissaud E, Meige H. Gigantisme et acromégalie. *J Med Chir Prat*. 1895;66:49.
 13. Giménez Caballero E. La casa de los muertos. *El Sol*. 21 Jan 1926.
 14. Masa P. El gigante que vendió su esqueleto. *Crónica*. 21 Jul 1935.
 15. Folgado de Torres LC. El hombre que compraba gigantes. Madrid: Altera; 2013.
 16. Sánchez Gómez LA. Anatomías míticas: el caso de Agustín Luengo Capilla, "El Gigante Extremeño". *Rev Hist Auton*. 2017;10:87-104.
 17. González Velasco P. Exposición Universal de París de 1878. Objetos remitidos por el doctor Velasco. *El Pabellón Médico*. 1978;122:32.
 18. Giménez Roldán S. El doctor Velasco, leyenda y realidad en el Madrid decimonónico. Madrid: Creación; 2012.
 19. Saucerotte N. Accroissement singulier en grosseur des os d'un homme âgé de 39 ans. *Melanges Chir*. 1801;1:407-11.
 20. Friedreich N. Hyperostose des gesamten Skeletes. *Virchow's Archiv für Pathologische Anatomie und Physiologie und für Klinische Medizin*. 1868;43:83-7.
 21. Brigidi V. Studii anatomopatologica sopra un uomo divenuto stranamente deforme par chronica infirmité. *Societe Medico Fisica Fiorentina*. 1877.
 22. Henrot H. Des lésions anatomiques et de la nature de myxoedème. *Hypertrophie générale progressive. Notes de Clinique Médicale Reims*. 1882;56.
 23. Marie P. L'acromégalie. *Nouv Icon Salpetriere*. 1888;1:173-257.
 24. Marie P. Sur deux cas d'acromégalie: hypertrophie singulière non congénitale des extrémités supérieures, inférieures et céphalique. *Rev Med Liege*. 1886;6:297-333.
 25. Dana C. On acromegaly and gigantism, with unilateral facial hypertrophy: cases with autopsy. *J Nerv Mental Dis*. 1893;18:725-38.
 26. Hutchinson W. A case of acromegaly in a giantess. *Am J Med Sci*. 1895;110:190-201.
 27. Hutchinson W. The pituitary gland as a factor in acromegaly and gigantism. *NY Med J*. 1898;67:341-4.
 28. Sheaves R. A history of acromegaly. *Pituitary*. 1999;2:7-28.
 29. De Herder WW. Acromegaly and gigantism in the medical literature. Case descriptions in the era before and the early years after the initial publication of Pierre Marie (1886). *Pituitary*. 2009;12:236-44.
 30. Mammis A, Eloy JA, Liu JK. Early descriptions of acromegaly and gigantism and their historical evolution as clinical entities. *Neurosurg Focus*. 2010;29:E1.
 31. De Herder WW. The history of acromegaly. *Neuroendocrinology*. 2016;103:7-17.
 32. Múgica S. El gigante de Alzo. *Euskal-Erria, Revista Bascongada*. 1896;35:410-4.
 33. Álvarez Osés JA. Un documento del Gigante de Alzo. *Munibe Ciencias Naturales*. 1974;26:197-9.
 34. Cabrera Muñoz E. Puebla de Alcocer y el Maestre de Alcántara Gutierre de Sotomayor. In: *Federación de Asociaciones Culturales de la Siberia, la Serena y Vegas Altas. VIII Encuentros de estudios comarcales: Vegas Altas, La Serena y La Siberia*. Badajoz (ES): SISEVA; 2016. p.9-20.
 35. Camacho Cabello J. La Siberia extremeña: marco geográfico y desarrollo histórico. *Rev Est Extr*. 1999;55:955-72.
 36. Espadas Fuentes R. La educación en Extremadura en el s. XIX: reformas introducidas durante el sexenio democrático (1868-1974). *Rev Est Extr*. 2001;57:131-80.
 37. Pulido Fernández A. Pedro González Velasco. In: *Médicos ilustres del siglo XIX. Conferencias leídas en el Ateneo de Madrid por los doctores Cortezo, Pulido, Goyanes, Pinilla y Luis, y Yagüe*. Madrid: Imprenta del sucesor de E. Teodoro; 1926. p.35-65.
 38. Arquiola E. González Velasco, reformador de los saberes morfológicos. *Medicina & Historia*. 1986;14:4-26.
 39. Montoliú Camps P. Madrid en la Guerra Civil: la historia. Madrid: Sílex; 2000.
 40. Pulido Fernández A. El Dr. Velasco. Madrid: Establecimiento tipográfico de E. Teodoro; 1894.
 41. Francos Rodríguez J. Obituario. *Academia Española de Ciencias Antropológicas*. 1882.
 42. Ovilo y Otero M. Escenas Contemporáneas. Historia de las Cortes y biografías de los senadores y diputados. *Revista política, literaria y de ciencias, artes, comercio, agricultura y teatros. Biografía del doctor Pedro González Velasco*. Madrid: Imprenta de Antonio Peñuelas; 1868.
 43. De Herder WW. Acromegalic gigantism, physicians and body snatching. Past or present? *Pituitary*. 2012;15:312-8.
 44. Cunningham DJ. The skeleton of the Irish giant, Cornelius Magrath. *The Transactions of the Royal Irish Academy*. 1887-1892;29:553-612.
 45. Cushing H. The pituitary body and its disorders: clinical states produced by disorders of the hypophysis cerebri. Philadelphia: JB Lippincott; 1912.
 46. Pendleton C, Wand G, Quiñones-Hinojosa A. The autopsy was conducted "under most inauspicious circumstances:" John Turner, Harvey Cushing's case XXXII, and his unwitting contributions to the early understanding of acromegaly. *Pituitary*. 2010;13:324-8.
 47. Musa BU, Paulsen CA, Conway MJ. Pituitary gigantism. *Endocrine studies in a subject with hypergonadotropic hypogonadism*. *Am J Med*. 1972;52:399-405.
 48. Daughaday WH. Extreme gigantism: analysis of growth velocity and occurrence of severe peripheral neuropathy and neuropathic arthropathy (Charcot joints) *New Eng J Med*. 1977;297:1267-9.
 49. Pearce JM. Pituitary tumours and acromegaly (Pierre Marie's disease). *J Neurol Neurosurg Psychiatry*. 2002;73:394.
 50. Pearce JM. Nicolas Saucerotte: acromegaly before Pierre Marie. *J Hist Neurosci*. 2006;15:269-75.
 51. Zarzoso A. Colecciones anatómicas y regímenes de exhibición. Una introducción. *Dynamis*. 2016;36:11-25.

52. Fulton JF. Harvey Cushing: a biography. Springfield: Charles C. Thomas; 1945.
53. Bergland RM. New information concerning the Irish giant. *J Neurosurg.* 1965;23:265-9.
54. Landolt AM, Zachmann M. The Irish giant: new observations concerning the nature of his ailment. *Lancet.* 1980;1:1311-2.
55. Chahal HS, Stals K, Unterländer M, Balding DJ, Thomas MG, Kumar AV, et al. AIP mutation in pituitary adenomas in the 18th century and today. *New Eng J Med.* 2011;364:43-50.
56. Radian S, Diekmann Y, Gabrovská P, Holland B, Bradley L, Wallace H, et al. Increased population risk of AIP-related acromegaly and gigantism in Ireland. *Hum Mutat.* 2017;38:78-85.
57. Viciano J, De Luca S, López-Lázaro S, Botella D, Diéguez Ramírez JP. A probable case of gigantism/acromegaly in skeletal remains from the Jewish necropolis of "Ronda Sur" (Lucena, Córdoba, Spain; VIII-XII centuries CE). *Anthropol Anz.* 2015;72:67-87.
58. Pulido Fernández A. Apuntes sobre el estado actual de la Medicina en España y Portugal. Madrid: Imprenta, fundición y estereotipia de D. Juan Aguado; 1875.
59. Doyal L, Muinzer T. Should the skeleton of the "Irish giant" be buried at sea? *BMJ.* 2011;343:d7597.
60. Museum of London Human Remains Working Group. Policy for the care of human remains in Museum of London Collections. London: Museum of London; 2011.
61. Antoine D. Chapter 1: Curating human remains in museum collections: broader considerations and a British Museum perspective. In: Fletcher A, Antoine D, Hill JD (eds). *Regarding the dead: human remains in the British Museum.* London: The Trustees of the British Museum; 2014. p.3-9.
62. Sellevold BJ. Ancient skeletons and ethical dilemmas. In: Fossheim H (ed). *More than just bones: ethics and research on human remains.* Oslo: The Norwegian National Research Committee; 2012.
63. Katznelson L, Laws ER, Melmed S, Molitch ME, Murad MH, Utz A, Wass JAH. Acromegaly: an endocrine society clinical practice guideline. *J Clin Endocrinol.* 2014;99:3933-51.
64. Rix M, Laurberg P, Hoejberg AS, Brock-Jacobsen B. Pegvisomant therapy in pituitary gigantism: successful treatment in a 12-year-old girl. *Eur J Endocrinol.* 2005;153:195-201.