



SAPIENZA
UNIVERSITÀ DI ROMA



© Author(s)
E-ISSN 2531-7288
ISSN 0394/9001



MEDICINA NEI SECOLI

Journal of History of Medicine
and Medical Humanities

38/2 (2026) 99-116

Received: April 2025

Accepted: March 2026

DOI: 10.13133/2531-7288/3335

Corresponding author:

lucaventura67@gmail.com

Traumatic Injuries, Death, and Funeral Treatment of Andrea Fortebracci da Montone (1368-1424) in the Writings of Ancient Chroniclers

Luca Ventura

Division of Pathology, “S. Salvatore” Hospital, L’Aquila, Italy

Mirko Traversari

Department of Medical and Surgical Sciences (DIMEC), University
of Bologna, Italy

Federico Bruno

Division of Neuroradiology and Interventional Radiology, “S. Salvatore”
Hospital, L’Aquila, Italy

Benedetta Risolo

Italian Institute of Design, Perugia, Italy

Alessandro Ricci

Division of Neurosurgery, “S. Salvatore” Hospital, L’Aquila, Italy

Achille Giuliani

Independent Researcher in Numismatics and Archival Sources,
L’Aquila, Italy

ABSTRACT

Braccio da Montone, a celebrated mercenary leader, died on June 5, 1424, after being wounded in a battle near Aquila. Born in 1368, Braccio’s early military career began when his family was exiled from Perugia. He served under notable leaders, seizing key cities including Rome and Bologna. After death, Braccio’s remains were disposed of in Rome and transferred to Perugia in 1432.

Historical accounts of his injuries vary. A biography describes multiple wounds, and the captain’s eventual refusal of medical care. Other chronicles provide additional details about his final moments and the funeral treatment of his body.

Recent examinations of Braccio’s bones revealed traumatic injuries consistent with these historical accounts. Despite discrepancies between historical records, these findings confirm that Braccio’s injuries were severe and likely led to paralysis before death. A skull wound likely caused by a war hammer may have contributed to his death.

Keywords: Braccio da Montone - Trauma - Death - Embalming - Chronicle

Introduction

June 5, 2024 marked the sixth centenary of the death of Braccio da Montone, one of the most celebrated mercenary captains of his time (Fig. 1). Mortally wounded in the battle fought in the plain of Bazzano (June 2, 1424) on the outskirts of Aquila (now L'Aquila), his defeat ended the siege of the city and his ambition to create his own state in central Italy. Braccio did achieve some success, as he dominated Umbria, a considerable part of the current Marche region and the Principality of Capua¹. An eventual victory in Aquila would have given him the balance of power in the political struggle between the Papal States and the Kingdom of Naples, changing perhaps the course of Italian history.



Fig. 1. Braccio da Montone. Anonymous portrait housed in the City Hall of Perugia.

Braccio's life and deeds

Born to Oddo count of Montone and Giacoma Montemellini, Andrea Fortebracci da Montone (also known as Braccio da Montone) was born in Perugia on July 1, 1368. The bishop and humanist Giovanni Antonio Campano, the author of Braccio's main biography, wrote that he was able to bear military weights at only 18. His father's involvement in internal strife in Perugia and the family's subsequent exile drove Braccio to a military career, first as a page to Guido d'Ascanio and then in the retinue of Alberico da Barbiano. In 1391, when he was in the pay of the count of Montefeltro, he attacked the fortress of Fossombrone, a stronghold of the Malatesta family, but was taken prisoner and freed only upon a ransom being paid. In 1414, he formed an alliance with Florence and passed into the service of Antipope John XXIII (1410-1415) fighting against the troops of the king of Naples Ladislaus of Anjou-Durazzo (1386-1414). He took Perugia (1416) establishing his seignory there; then he kept Rome for seventy days (1417), and finally conquered Bologna (1420). Siding against Pope Martin V (1417-1431), he supported the Neapolitan barons, and was excommunicated. Once he obtained the Principality of Capua, he entered the service of Alfonso V (1416-1458), king of Aragon and Sicily, who aimed to depose the queen of Naples Joan II of Anjou-Durazzo (1414-1435). That was to be his last campaign. After besieging the city of Aquila, which was defended by Antonuccio Camponeschi for more than a year (May 7, 1423 to June 2, 1424), Braccio was defeated and overwhelmed by the papal-Angevin army led by Giacomo Caldora. At the end of his last battle, he was severely wounded and died on June 5, 1424².

The writings of medieval chroniclers

Due to the absence of official records, the historiographical reconstruction of Braccio's injuries and death can be based on three main sources. A biography was written in Perugia in around 1458 by the humanist Giovanni Antonio Campano (1429-1477) and published posthumously in 1572³. Two manuscript chronicles that are almost contemporary are *Cronaca delle cose dell'Aquila, dall'anno 1363 all'anno 1424*⁴ by Niccolò da Borbona, possibly a storyteller about whom there is no precise information, and the *Cantare anonimo*⁵ celebrating Aquila's victory over Braccio, which may be dated between 1450 and 1456⁶ and also known by the seventeenth-century title *Guerra dell'Aquila*⁷.

The first wounds he received on a battlefield are told by Campano and date back to the assault on the fortress of Fossombrone (1391). Braccio, struck in the chest and in one shoulder, was knocked unconscious and captured, but a few days after liberation he had already recovered, for he was plundering while suffering a new blow to the back of the neck ("*nella collotola*") that paralyzed the left side of his body for some time, leaving him lame for the rest of his days:

Braccio mezzo morto ricevute di molte ferite, et tra l'altre una in mezzo del petto, et l'altra, che gli passava la spalla da banda a banda, fu fatto pregione. (...) Non havendo potuto

combattendo dargli la morte (ancor che chiaramente conoscessero ch'ella non gl'era molto lontana) cercando d'accelerargliele, desideravano così pregione, d'ammazzarlo, et l'havrebbero fatto, se la crudeltà non havesse dato luogo all'avaritia, perciò che udendo essi, che se lo liberavano dalla morte, egli prometteva di pagar loro duemila ducati, gli perdonarono finalmente la vita. (...)

Lasciarono Braccio, così com'era ferito, il quale da' suoi raccolto, et a gli alloggiamenti condotto fu con gran diligenza medicato, et fuor dell'opinione di ciascuno liberato. Et pochi giorni dopo andando egli per lo medesimo contado predando, gli fu data una ferita nella collotola, per cagion della quale restò lungo tempo di tutto 'l lato sinistro attratto et immobile, ma aiutato dall'età et dalla diligenza de' medici, cominciò dopo alcuni mesi a muovere il braccio.

Non già così della gamba, et del resto del lato gli avvenne, perciò che quantunque i medici adoperando fomenti, et bagni, et ogn'altra sorte di medicamento, lo risanassero interamente del braccio, non poterono però affatto risanargli la gamba, ma operarono in guisa, che non solamente potea camminare, ma che caminando non mostrava alcuna bruttezza⁸.

He was also wounded in 1419, in the war against Guidantonio da Montefeltro, when an arrow shot from the fortress of Spoleto pierced his foot and nailed it on the ground:

Braccio presa che ebbe la torre, cercando di occupare il ponte, del quale havea già libera l'entrata, combatteva anch'egli coperto d'uno scudo (...) una freccia tirata dalla rocca gli trapassò un piede et si ficcò talmente in terra, che non si poteva cavare né dal piede, né dalla terra⁹.

Finally, Campano describes Braccio's fatal wounding at the battle of Bazzano, near Aquila (June 2, 1424). First, Braccio received a wound in the middle of his throat. It was so serious that his soldiers began to leave the battlefield believing him already dead, but not severe enough to prevent him from defending himself. Then he received other wounds (many, but the number is unspecified) that made him fall from his horse. Thus, a soldier named Vittore took him prisoner and, after having him mounted on his own horse, handed him over to Caldora, who out of pity led him to his own tent. Campano concludes by saying that Braccio died (June 5) without ever uttering a word, refusing physicians' care (the sentence "he was sent to several places for doctors" suggests that the condottieri had at least one trusted one in tow¹⁰), as well as water and food:

Un soldato privato diede una ferita a Braccio nel mezzo della gola, mentre egli andava essortando i suoi, ovvero (come altri dicono) ritenendogli dalla fuga. Onde subito i suoi soldati (non mai più per l'adietro vinti) pieni di spavento, credendosi ch'egli fosse morto, furono rotti, et a tutta briglia si misero in fuga. Et Braccio combattendo, et difendendosi, abbattuto finalmente da molte ferite, vivo ancora, ma come huomo, che di corto dovea morire, fu preso da un privato soldato, non conosciuto avanti a quel dì, chiamato Vittore, il quale in sul suo proprio cavallo, lo condusse avanti al generale.

Il Caldora (...) mosso a compassione, et fattolo smontar da cavallo, et condottolo dentro al suo padiglione, cortesissimamente gli parlò. Ma egli o che non udisse, o che fingesse di non udire, non rispose mai, né a lui, né ad altri pur una minima parola, o perché le mortali, et profonde piaghe, gli havessero tolto il sentimento, o perché quantunque la fortuna havesse dato in poter de' nemici il suo già quasi perduto corpo, egli nondimeno ritenesse ancora seco l'animo invitto. Fu mandato in più luoghi pe' medici, i quali non lasciarono alcuna cosa a dietro per guarirlo, essendo loro stati offerti grandissimi premi dal vincitore. Ma essendosi egli ostinato

di morire, ricusava ogni sorte di medicina, et havendo già passato tre giorni interi senza mangiare, et senza bere, et senza pur mai dire una parola, quasi non volendo che i nemici havessero di sé in poter loro altro, che un corpo mutolo, essendo egli d'età di cinquantasei anni, et vivendo ancor la madre, morì, non si sa se per cagion delle ferite, o della debolezza, ancor, che i medici facessero giuditio, ch'egli haverebbe potuto campare. Tale fu il fine di questo valoroso capitano¹¹.

Niccolò da Borbona's chronicle adds more details about Braccio's last hours, giving us a hint that he was chased and encircled by four men. In it we read that before he surrendered to Messer Jacopo, a certain Briante made his horse exhausted and another of his Perugian enemies, Lionello, unhorsed him. They were upon him, and after another enemy had knocked off his helmet by striking it with a spear, they wounded him in the head three times, together with Ludovico de' Michelotti. Braccio was then led to Caldora's pavilion and there, watched over by several men, finally died on Sunday before two o'clock, while his defeat was on Friday, June 2, at 4 p. m.:

Era sì opresso, che lli fu il cavallo fatto fiaccare per Briante ch'era apresso a llui, e uno peroscino Lionellio suo inimicho li ferio adosso, essennoli caduta la celata per un altro, che lli avia percosso co' la lancia, e caduto a terra ebe da loro, e da Lodovico de Michelotti in testa tre ferite, e così s'arrenneo a missere Jacopo (...).

Braccio fo portato al suo pavillione, e là fu guardato da multi, e in fine morio la domenica nanzi li doi ore, e la rotta, e desconfitta loro fo el venerdì a hore quasi 16 e a dui del mese de iungnio 1424, e apresso se ne annarono a Paganica la maiure parte de nostre genti¹².

The *Cantare anonimo* gives us other details, namely that Braccio had already been wounded in the face during the siege of Aquila ("hebbe una ponta su la guancia")¹³, and that the blow to the throat mentioned by Campano followed a blow to the head ("nel capo, e in canna"). Since this was a mounted combat, both blows probably came from a spear ("punta lassò gire"). This version also agrees with Campano's biography in other respects (the fall, the stunning, and the abandonment by his troops), but not with Braccio's recovery from the battlefield, which would have taken place in a completely different way, with the intervention of Caldora and not *Vittore*, carried on a shield ("in un targone") and not on the soldier's horse, taken to a cellar in Bazzano instead of Caldora's tent. Furthermore, there is no mention of several doctors, but only one ("el medico") promptly brought to the scene ("li fe' presto venire"). This doctor actually treated the Perugian commander ("colle soe mani scì lo medicòne"), thus contradicting the idea that Braccio refused treatment. However, his medical condition must have been so severe ("lo volèa guarire, e retornarelu da morte a vita") that it prevented him from taking any voluntary action:

Un de familli Braccio hebbe a ferire, e furno culpi, che non giro in fallo; nel capo, e in canna punta lassò gire, dal sou destriero gettò da cavallo, e morto sì paria senza mentire, coscì per morto scì, che là lassallo; in questo li bracceschi dero volta, li nostri insieme fecero raccolta. (...)

E misser Iacof[bu], che è plino di senzo, ha fatto Braccio di terra levato; in un targone fu misso in certàno, portato in una vasca di Vazzàno.

El medico li fe' presto venire, felli tentare ciascuna ferita; iusta soa possa lo volèa guarire, e retornarelu da morte a vita; conte Francisco scì lo hebbe a sentire, quella persona magna, e tanto ardita colle soe mani scì lo medicòne, poco stette, el signor Braccio spiròne¹⁴.

In Muratori's text we find an interesting note by Antinori, the historian from Aquila who collaborated with him in the transcription of Niccolò da Borbona's chronicle¹⁵. He says that Francesco Sforza (that "*conte Francisco*" who in the *Cantare anonimo* witnesses Braccio's treatment and death), having heard that the doctor wanted to save Braccio, gave him the *coup de grace* by pressing his hand on that of the doctor who at that moment was cleaning his head wound with a metal point. The action damaged the brain and caused Braccio's death. Antinori also recalls the Latinized version of the *Cantare anonimo*, the *Bellum Braccianum Aquilae gestum*, written by Angelo Fonticulano and published in 1580:

Parla in istretto d'un fatto noto, e fu dal Fonticulano tradotto così: quod ubi comes Franciscus Sfortia audivit, accessit, et medici manui, quam caput ferreo stilo purgare curabat, manum imposuit, atque impressit, et laeso cerebro, paulo momento... Braccius animam evomuit¹⁶.

The issue was revisited by Carlo De Matteis, who in the late 1990s edited the new critical edition of the *Cantare anonimo*. Sforza's responsibility for Braccio's death was withheld by almost all chroniclers, including Campano, because of diplomatic exigencies toward the man who had become duke of Milan since 1450. It is highly plausible and is explained by the fierce grudge the young condottiero bore against the man who had been the cause of his father's death.

La responsabilità di Sforza nella morte di Braccio fu taciuta da quasi tutti i cronisti, compreso il Campano, per esigenze diplomatiche nei confronti di colui che dal 1450 era divenuto duca di Milano; d'altro canto essa è verosimile e si spiega con il feroce risentimento che il giovane condottiero portava verso l'uomo che era stato la causa della morte del padre¹⁷.

Getting back on topic, the *Cantare anonimo* also provides us with the only information about the funeral treatment of the body. The body was disembowelled ("*fo sparato tratto quel dentro*") and covered with quicklime ("*fo incalcato*") as the rank deserved ("*non ne volze mino, como che merito*"). It was then sent to Rome where Pope Martin V, after excommunicating Braccio for the second time, had it thrown into a cave located in the field of the basilica of San Lorenzo:

Et concludendo in fine fo sparato tratto quel dentro non ne volze mino; como che merito sì fo incalcato, e fo mandato da papa Martino; el papa, ch'ellu havea scomunicato, nel campo san Lorenzo in quil terrino in una grotta elli sì fo gettato, como christiano falso, e condannato¹⁸.

According to De Matteis, embalming could not be denied to a figure such as Braccio was¹⁹, but there was probably also a need to preserve the body due to the heat and travel time in order to facilitate recognition by the pope. The same author also points out a significant discrepancy between the *Cantare anonimo* and Fonticulano, namely the funeral treatment with salt instead of lime, whose effects equally prevent decomposition²⁰. In this regard, Niccolò da Borbona says only that the body was transported to Rome in a chest (he does not indicate the day of departure either, but reports it after the events of June 16) and, after the excommunication, buried in the unconsecrated ground of the basilica:

El corpo de Braccio ne fo mannato a Roma in una cassia, el papa si lu fece scomenicare con granne solennitade, e fore di Roma lu sotterrò da fore de santo Lorenzo in salvatico loco²¹.

Finally, from Campano we also trace the translation of the mortal remains (already skeletonized) in Perugia in 1432 at the request of Niccolò della Stella, Braccio's nephew, also a condottiero, who called himself so to honor the memory of his mother, Stella di Oddo dei Fortebracci, who was Braccio's sister:

Ricuperò l'ossa del zio, et le rimandò a Perugia, dove i Perugini ricordevoli de' ricevuti benefici, gli fecero honoratissime essequie²².

Inspections of Braccio's skeletal remains

In Perugia, Braccio's remains were buried in the church of San Francesco al Prato, where the Fortebracci had their family memorial chapel. His bone remains were then preserved in a 15th-century wooden chest. After restoration work on the casket in 2013 and the rearrangement of the entire aristocratic chapel in 2024, the human remains of the Perugian condottiero have recently found their final location (Fig. 2).

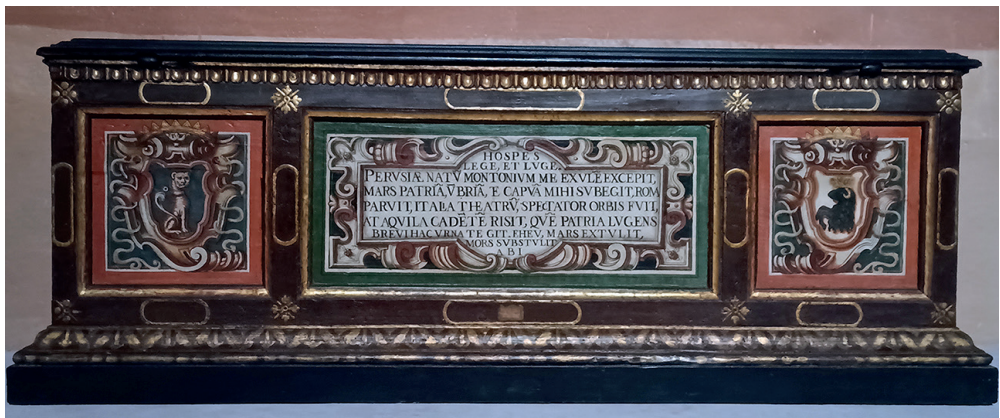


Fig. 2. The wooden casket containing Braccio's remains in the church of San Francesco al Prato, Perugia.

The first known examination of the bone remains belonging to Braccio dates back to 1908, and the documentation of that event was kept in a lead pipe along with his bones. In 2006, the bone remains underwent visual inspection and direct radiological examination, from which thirteen years later an article in Italian was written²³. A new direct inspection of the bones was performed in 2013 when the ancient wooden case that contained them was restored. As far as we know, the results of this latest inspection have never been published.

A careful reading of the Italian paper written by Mallegni et al. in 2019 allowed us to obtain information about traumatic injuries as they were observed in direct sources. We provide here an almost literal translation of some findings that were reported by these researchers.

MANDIBLE - Fairly large horizontal dimple in left midbody from mental foramen of the mandible to origin of the ramus. Same patterns on the inner surface of the body. Resolved traumatic event. Stab wound (sword, small axe?) inflicted by a right-handed attacker from top to bottom.

STERNUM - Ossification of the right first sternocostal joint. Fusion with the right first rib, probably due to heavy ergonomic activity.

RIGHT PARIETAL BONE - At 1 cm from the lambdoid suture and 0.5 cm from the sagittal plane, a small almost circular crater with a very small hole at the bottom is observed. Result of arrowhead wound, which nicked the bone, destroying a fraction of the outer table. The trajectory of the projectile is not known, although the greater extension of the lesion in its posterior part may indicate its arrival from that direction and its arrest, with consequent formation of the small anterior wall, with greater verticality than in the posterior part.

LEFT PARIETAL - Superficial wound of elongated shape. Trajectory slightly oblique to the surface of the head. Projectile (arrow?) that slightly nicked the outer table (sign of successful healing, like the previous wound).

RIGHT PARIETAL – Close to and slightly below the insertion of the temporalis muscle, there is a rectangular pervious opening, the major sides of which are oriented antero-posteriorly; this lesion is inscribed in a semi-triangular, approximately isosceles-shaped space, in which the compact is missing from its outer edges to the previously defined rectangular hole, due to sinking. Caused by a sharp, rectangular metallic object that caused loss of bone substance. The trauma was definitely the cause of the subject's death, given the penetration of the cranial box and the resulting brain injury, as well as a definite and extensive endocranial hemorrhage.

Reassessment of traumatic injuries

A critical re-evaluation of the figures published by Mallegni et al, along with the examination of the original x-rays performed in 2006 and of additional photographs taken by people who had attended this operation, allowed us to amend some of the conclusions drawn by the authors. These appear to be influenced by the lack of knowledge of the medieval sources we have reported.

First, the described changes in the mandible and sternum are certainly long-term results. In the case of the mandibular lesion, we totally agree on its traumatic etiology. On the other hand, with regard to the ossification of the right first sternocostal joint and the fusion with the rib, which the authors attributed to marked ergonomic activity, we believe that it may represent the result of a fracture of the costal cartilage. Unfortunately, costal cartilage fractures are not easily recognized by radiography even in modern patients²⁴. In the present case, chondral ossification is bilaterally evident but the right sterno-costal joint space appears markedly irregular and partially obscured by diffusely radio-opaque calcification involving both the manubrium and the costal cartilage (Fig. 3). The external profile of the fused sternal-costal block, as seen in the image published by the authors, confirms the hypothesis of a consolidated fracture.



Fig. 3. Radiographic evidence of diffuse calcification in the right first costal cartilage and the corresponding sternocostal joint as a possible result of trauma. Ossification of the contralateral first costal cartilage.

Costal fractures are the most common thoracic lesion after direct chest trauma. Fracture of the first costal cartilage is observed almost exclusively in males as a result of high-energy blunt trauma or a fall. Such lesions are extremely difficult to detect and may be radiographically evident only when the cartilage is calcified²⁵. In the case of Braccio, this lesion could be the result of the injuries to the chest and one shoulder suffered during the attack on the fortress of Fossombrone in 1391, as described by Campano. Alternatively, the injury could have been sustained during a knight's tournament or a joust, in which the right shoulder could have been unprotected by the shield.

More importantly, all three cranial lesions were on the right parietal bone, not two on the right parietal and one on the left one as reported. Since the consulted historical sources indicate that archers were not involved in the field battle of Aquila, but only crossbowmen, the hypothesis that the two non-penetrating wounds were caused by arrows does not seem plausible (Fig. 4). In addition, lesions of flat bones from crossbow bolts result from a high penetration capacity that is sufficient to cause perforating wounds. Compared to a high-speed projectile, a larger mass pushes onto a smaller but sharp frontal surface²⁶. Finally, a penetrating arrow/bolt wound to the head would certainly not have gone unnoticed, and the chroniclers would not have missed it.



Fig. 4. A clash between Aquilans and Bracceschi during the siege of Aquila (Cantare anonimo, recto page 32). Note the crossbow held by an Aquilan soldier and the mallet wielded by a besieger. (Autore anonimo, Guerra dell'Aquila, XV secolo, ms. 3061, c. 32r). © concession of Biblioteca Comunale Augusta (Perugia), with prohibition of further duplication.

Moreover, it is to be ruled out that the upper part of the skull could have been struck by arrows in the course of the close combat described in all three sources considered. Instead, it looks far more plausible that the injuries were caused by blows from polearms or handheld weapons, striking the unprotected head (Braccio had lost his helmet) possibly from behind and slightly from above.

The weapon that could have caused such damage may have been a mallet or, more likely, a war hammer, which was widely used in the armies of the 14th and 15th centuries. Figure 5 shows our suggested directions of blows, most likely to be inflicted by right-handed aggressors striking an unarmed victim from behind and from above.

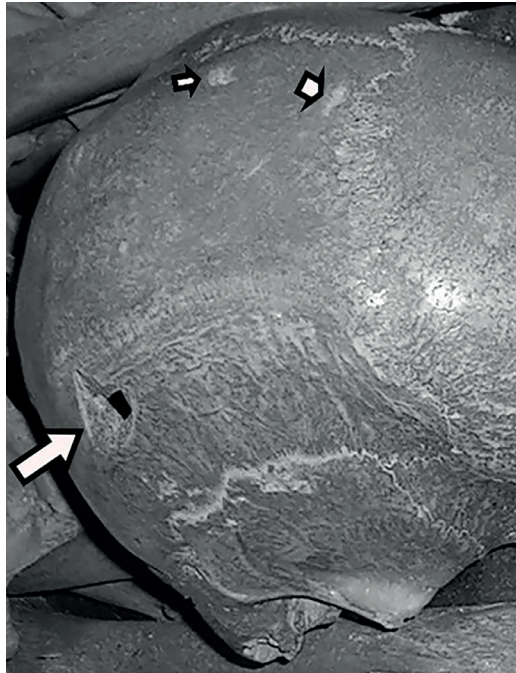


Fig. 5. Skull lesions in the right parietal bone. Arrows show the direction of the blows with their length indicating the penetration force.

According to the medieval chroniclers, the total number of wounds on the head of Braccio is three. After being unsaddled and stripped of his helmet, he surrendered, but when the Perugines arrived, they attacked him again. Unfortunately, we cannot be sure whether the injuries to the exposed head occurred during a further attempt to escape or when the victim fell to the ground.

Undeniably, the penetrating skull injury was the one that resulted in the most severe consequences, although it remains impossible to ascertain the full extent of these consequences with any certainty. In fact, these depend mainly on the depth of penetration of the object inside the skull, which cannot be calculated from the shape and size of the injury alone (Fig. 6).



Fig. 6. Lateral radiogram of Braccio's calvarium showing a full-thickness square bone defect, inscribed in a quadrangular lesion of the outer table.

The penetrating injury certainly had accessory fractures on the outer table, as is the case with trauma inflicted on fresh skulls (*peri-mortem*) in contrast to those inflicted on dry bone²⁷. Although the researchers did not photograph or endoscopically document the inner surface of the skull vault, it is likely that small fractures were also present in the inner table. Close examination of the defect's external surfaces with special equipment, such as 3D scanners and digital microscopes, would have been very helpful in defining the lesion. Also, a detailed CT scan or an endoscopic examination of the skull would have shown the endocranial contours of the lesion. Endoscopy would also have allowed identification of any endocranial blood stains.

As previously mentioned, depending on the depth of penetration into the cranial cavity, the object could have caused a subdural or even an intracerebral hematoma of greater or lesser magnitude. In any case, given the right-side damage, the symptoms experienced by Braccio would have been paralyzing, and speech would not have been affected. The presence of aphasia can only be assumed if the subject was left-handed or ambidextrous. The data collected by Mallegni et al. offer valuable insights that contribute to a better understanding of this aspect. Their findings on the bones of the upper limbs (scapular index, humeral interosseous ridge, oleic index, radius robustness) indicate a greater muscular development of the left side than the right side,

clearly outlining a left-handed individual. However, it is not possible to determine whether Braccio was a natural or adaptive left-hander. An adaptation of the hand may have been the result of the traumas he suffered as a young man at Fossombrone or of other events not recorded in the writings. In his account of the episode, Campano speaks of a neck wound that left him with stiffness and immobility of the left limb, which improved only a few months later through the work of doctors (*“gli fu data una ferita nella collotola per cagion della quale restò lungo tempo di tutto ’l lato sinistro attratto et immobile, ma aiutato dall’età et dalla diligenza de’ Medici, cominciò dopo alcuni mesi a muovere il braccio”*)²⁸. The historian may have erroneously indicated the left side, given that the concept of laterality was not codified in antiquity as it is today. In summary, the manifestation of aphasia in the final days of his life, as a result of the trauma to the right side of his head, could only be explained by the presence of natural left-handedness. Conversely, an adaptive form of left-handedness is not a plausible cause for the aphasia. A further complicating factor that should be taken into consideration is the potential for a left hemisphere *contrecoup* injury.

Lastly, one more point should be addressed. The greater external width of the lesion, due to the more extensive absence of the outer table, may ultimately represent the result of the physician’s care. He may have deliberately removed splinters that had already detached from the outer cortical bone to avoid more serious consequences. However, no tool marks were identified in the area of the perforation.

Death and funeral treatment

The writings of medieval chroniclers provide us with the relevant elements of the procedure used in the funerary treatment of Braccio’s body. The subject was not considered by Mallegni et al. and bone changes related to possible cuts made during the autopsy are not mentioned in their study. The anonymous *Cantare* reports that a person of Braccio’s lineage could not be denied funeral treatment, but we cannot overlook the practical need to preserve the body and keep it recognizable all the way to Rome. Niccolò da Borbona’s chronicle indicates that the body was sent to the Pope after mentioning the events that occurred on June 16, but it is not known whether this was the date of departure or arrival. Even in the latter instance, at least 10 days would have elapsed since the death, and after such a long lapse of time, especially in the summer season, an untreated corpse would have shown marked putrefactive changes. The preservation technique employed involved evisceration and treatment with lime, but the *Cantare* does not report any further details about this treatment. Thus, we do not know if the substance was applied to the outside of the eviscerated body, or if it was also applied to the inside, and in what manner. Given the known properties of lime, which is corrosive when in direct contact with biological tissues, we can speculate that it was used taking care to place textiles between it and the body surfaces to

be treated²⁹. Other examples of embalming carried out in Aquila and the surrounding area in the 15th century mostly concern religious figures, but it is highly probable that this treatment was very often reserved for lay notables as well. However, on the basis of historical sources, we can state that Braccio represents the earliest documented case of embalming performed in Aquila in the 15th century³⁰.

Finally, Fonticulano's Latin adaptation of the *Cantare* specifies that the entrails and the brain were removed and that the substance used for embalming was salt, not lime. These seemingly more detailed elements may simply refer to practices in Fonticulano's own time, in the 16th century.

Conclusions

The critical re-evaluation of a past inspection of Braccio's human remains along with writings by medieval chroniclers led us to frame more correctly the reported skeletal lesions.

The mandibular and sternal changes are long-term effects. While the mandibular lesion is clearly traumatic, the ossification of the right first sternocostal joint likely results from a rib cartilage fracture rather than ergonomic activity. Such lesions are consistent with injuries suffered by the captain at a young age.

Regarding cranial traumas, all three lesions were on the right parietal bone. The hypothesis that arrows caused them is unlikely, as chroniclers mention only crossbowmen whose bolts would have resulted in penetrating wounds. Instead, the injuries align with blows from weapons like mallets or war hammers. Textual sources confirm Braccio sustained three head wounds. He was attacked after he surrendered, though whether he was attempting escape or had fallen remains uncertain. The penetrating skull injury likely led to paralysis, but speech was unaffected because the subject's left-handedness was adaptive rather than natural.

Braccio's body was artificially preserved by embalmment for preservation due to the custom of the time and the need to preserve it in the summer season. While historical records mention evisceration and treatment with lime, the details remain unclear. His case represents the earliest documented funeral body treatment in Aquila in 15th-century.

Further investigation, including 3D scanning, CT scanning, endoscopy, and digital microscopy are highly recommended as they could clarify the main trauma's extent and disclose any presence of signs produced by the autopsy.

Bibliography, references and notes

Antinori A, Cronaca di Niccolò di Borbona delle cose dell'Aquila, dall'anno 1363 all'anno 1424. In: Muratori LA, *Antiquitates Italicae Medii Aevi, sive dissertationes...* etc. Mediolani: ex Typographia Societatis Palatinae; 1738-1742. Vol. 6, pp. 872-874.

Blanchard P, Castex D, Coquerelle M, Giuliani R, Ricciardi M, A mass grave from the

- catacombs of Saints Peter and Marcellinus in Rome, second-third century AD. *Antiquity* 2007;81:989-998. <https://doi.org/10.1017/S0003598X0009606X>.
- Campano GA, L'Historie et vite di Braccio Fortebracci detto da Montone, et di Nicolò Piccinino perugini. Vinegia: Francesco Ziletti; 1572.
- De Matteis C (a cura di), La guerra dell'Aquila. Cantare anonimo del XV secolo. L'Aquila: Textus; 1996.
- D'Errico S, Turillazzi E, Pomara C, Fiore C, Monciotti F, Fineschi V, A novel macabre ritual of the Italian mafia ('ndrangheta). Covering hands with gloves and burying the corpse with burnt lime after execution. *Am J Forensic Med Pathol* 2011;32:44-46. <https://doi.org/10.1097/PAF.0b013e3181efbbf2>
- Facchini F, Rastelli E, Belcastro MG, Peri mortem cranial injuries from a medieval grave in Saint Peter's cathedral, Bologna, Italy. *Int J Osteoarchaeol* 2008; 18: 421-430. <https://doi.org/10.1002/oa.949>
- Falaschi PL, in Dizionario biografico degli italiani, vol. 49, Roma, Istituto dell'Enciclopedia Italiana, 1997. URL visited 2 april 2024.
- Giuliani A, De Benetti M, Bruno F, Barile A, Traversari M, Ventura L. Le monete nel corpo del Beato Jean Bassand (c. 1360-1445). *Storiografia e analisi dei reperti. Med Secoli* 2023;35(3):143-192. <https://doi.org/10.13133/2531-7288/2825>.
- Karger B, Bratzke H, Graß H, Lasczowski G, Lessig R, Monticelli F, Wiese J, Zweihoff RF, Crossbow homicides. *Int J Legal Med* 2004; 118: 332-336. <https://doi.org/10.1007/s00414-004-0474-z>.
- Kaufmann MH, Whitaker D, McTavish J, Differential diagnosis of holes in the calvarium: application of modern clinical data to palaeopathology. *J Archaeol Sci* 1997; 24: 193-218. <https://doi.org/10.1006/jasc.1995.0104>.
- Kim MJ, Oh CS, Lee IS, Lee BH, Choi JH, Lim D-S, Yi YS, Han W-J, Kim Y-S, Bok GD, Lee SD, Shin DH, Human mummified brain from a medieval tomb with lime-soil mixture barrier of the Joseon dynasty, Korea. *Int J Osteoarchaeol* 2008;18:614-623. <https://doi.org/10.1002/oa.962>.
- Lamponi R, Braccio da Montone e la Marca d'Ancona: tappe di un tentativo di coordinamento unitario. *Picenum Seraphicum* 2021;35:25-62.
- Lopez L, La guerra aquilana di Braccio da Montone. L'Aquila: Futura; 1986.
- Mallegni F, Ricci S, Capecci G. Biologia delle spoglie mortali di Braccio Fortebraccio da Montone (1368-1424). *Archivio per l'Antropologia e l'Etnologia* 2019;149:95-118.
- Morosini G, The body of the Condottiero. A link between physical pain and military virtue as it was interpreted in Renaissance Italy. In: Rogge J (ed.), *Killing and being killed: bodies in battle. Perspectives on fighters in the Middle Ages*. Bielefeld: Transcript Verlag; 2017. pp. 161-193.
- Muzi G, Memorie civili di Città di Castello. Città di Castello: presso Francesco Donati; 1842-1844. 7 voll.
- Pasqualetti C, Le illustrazioni di battaglia nel ms. 3061 della Biblioteca Augusta di Perugia: alle origini dell'immagine della città dell'Aquila. In: Abbamonte G et al. (eds), *La battaglia nel Rinascimento meridionale*. Roma: Viella; 2011. pp. 69-82, ff. (22-26).
- Regni C, Braccio da Montone: the adventure of a noble warrior. In: Zucchini S (ed.), *Condottieri: war and society in central Italy during the fourteenth century*. Proceedings of the conference. Perugia, 5 May 2006. Perugia: Digital Point, 2006. pp. 40-51.
- Schotsmans EMJ, Van de Voorde W, Concealing the crime: the effects of chemicals on human tissues. In: Schotsmans EMJ, Márquez-Grant N, Forbes SL (eds), *Taphonomy of human*

remains: forensic analysis of the dead and the depositional environment. John Wiley & Sons, 2017;335-351. <https://doi.org/10.1002/9781118953358.CH22>.

Ventura L, From L'Aquila to Europe. Bodies and burials of the Franciscan Observance leading figures, 600 years after its introduction in Abruzzo region (1415). II National Meeting of the Italian Group of Paleopathology (GIPaleo), L'Aquila, 31 october 2015. *Pathologica* 2015;107:215.

Ventura L, Gaeta R, The facial skin eruption in the mummy of the Blessed Jean Bassand (c. 1360-1445). *Med Hypotheses* 2020;144:110003. <https://doi.org/10.1016/j.mehy.2020.110003>.

Ventura L, Foscati A, Polymyalgia rheumatica in the Italian polyhistor Antonio Ludovico Antinori (1704-1778). *Rheumatology (Oxford)* 2020;59(12):3986-3988. <https://doi.org/10.1093/rheumatology/keaa583>.

Ventura L, The mysterious hole in the skull of Pope Celestin V. *Forensic Sci Med Pathol* 2021;17:529-533. <https://doi.org/10.1007/s12024-021-00371-3>.

Ventura L, Bruno F, Barile A, Masciocchi C, Bilateral fabella in the mummy of the Blessed Jean Bassand (c. 1360-1445). A unique description in ancient human remains. *Int J Osteoarchaeol* 2021;31:1276-1279. <https://doi.org/10.1002/OA.3019>.

Ventura L, Traversari M, Sabatini N, Cilli E, Telera G, Ripani M, A retrospective study on the artificial mummification of the Blessed Andrea da Montereale (AD 1479). *Med Histor* 2022;6(2):e2022016.

Zug Tucci H, La morte del condottiero: Braccio, i Bracceschi e altri. *Archivio Storico Italiano*, 2000;158:721-749.

1. See Falaschi PL, in *Dizionario biografico degli italiani*, vol. 49, Roma, Istituto dell'Enciclopedia Italiana, 1997. URL visited 2 april 2024, and Lamponi R, Braccio da Montone e la Marca d'Ancona: tappe di un tentativo di coordinamento unitario. *Picenum Seraphicum* 2021;35:25-62.
2. More details about Braccio da Montone's life and his last military campaign can be found in: Morosini G, The body of the Condottiero. A link between physical pain and military virtue as it was interpreted in Renaissance Italy. In: Rogge J (ed.), *Killing and being killed: bodies in battle. Perspectives on fighters in the Middle Ages*. Bielefeld: Transcript Verlag; 2017. pp. 161-193. Lopez L, La guerra aquilana di Braccio da Montone. *L'Aquila: Futura*; 1986. Regni C, Braccio da Montone: the adventure of a noble warrior. In: Zucchini S (ed.), *Condottieri: war and society in central Italy during the fourteenth century. Proceedings of the conference*. Perugia, 5 May 2006. Perugia: Digital Point, 2006. pp. 40-51. Zug Tucci H, La morte del condottiero: Braccio, i Bracceschi e altri. *Archivio Storico Italiano* 2000;158:721-749.
3. Campano GA, *L'Historie et vite di Braccio Fortebracci detto da Montone, et di Nicolò Piccinino perugini*. Vinegia: Francesco Ziletti; 1572.
4. Title reported by Antonio Ludovico Antinori in the critical edition by Muratori LA, *Antiquitates Italicae Medii Aevi...* etc. Mediolani: ex Typographia Societatis Palatinae; 1738-1742. vol. VI, coll. 851-880: a coll. 851-852 e 853-854.
5. In publishing this chronicle, which he titled *Della guerra dell'Aquila con Braccio da Montone*, negli anni MCCCCXXIII e MCCCCXXIV, Muratori erroneously ascribed it to the Aquilan Niccolò Ciminello da Bazzano, see *ibid.*, coll. 965-1032: a coll. 965 e 967-968; on this issue please refer fully to Pasqualetti C, *Le illustrazioni di battaglia nel ms. 3061 della Biblioteca Augusta di Perugia: alle origini dell'immagine della città*

- dell'Aquila. In: Abbamonte G et al. (eds), *La battaglia nel Rinascimento meridionale*. Roma: Viella; 2011. pp. 69-71.
6. See Pasqualetti C, Ref. 5. pp. 71-72.
 7. See Pasqualetti C, Ref. 5. p. 69. A copy (15th-century) of the manuscript work can be found in the Biblioteca Comunale Augusta of Perugia: Autore anonimo, *Guerra dell'Aquila*, ms. 3061.
 8. Campano GA, Ref. 3. pp. 2v-3r.
 9. Campano GA, Ref. 3. p. 86v.
 10. For example, we know that Città di Castello, in 1419, put just in Braccio's service "*due conestabili con 50 soldati, come avea domandato, nonché il medico Ugolino da Montecchio da lui richiesto*", see Muzi G, *Memorie civili di Città di Castello*. Città di Castello: presso Francesco Donati; 1842-1844. vol. I, p. 242.
 11. Campano GA, Ref. 3. pp. 139v-140r.
 12. Niccolò da Borbona, in Muratori LA, Ref. 4. coll. 873-874.
 13. Cantare anonimo, in Muratori LA, Ref. 4. col. 1024.
 14. Cantare anonimo, in Muratori LA, Ref. 4. coll. 1030-1031.
 15. The Aquilan polymath Antonio Ludovico Antinori (1704-1778) was greatest historian from Abruzzo region. For a brief account of his life and his ailments see: Ventura L, Foscati A, Polymyalgia rheumatica in the Italian polyhistor Antonio Ludovico Antinori (1704-1778). *Rheumatology (Oxford)* 2020;59(12):3986-3988.
 16. Muratori LA, Ref. 4. note 12 in col. 1031.
 17. De Matteis C (ed.), *La guerra dell'Aquila*. Cantare anonimo del XV secolo. L'Aquila: Textus; 1996. p. 198 (note on the verse 33).
 18. Cantare anonimo, in Muratori LA, Ref. 4. col. 1031.
 19. De Matteis C, Ref. 17. p. 198 (note on the verse 34).
 20. See De Matteis C, Ref. 17. p. 198 (note on the verse 34), che traduce così la versione di Fonticulano: "*furono cavate le interiora e il cervello (...) il resto del corpo fu riempito di sale*".
 21. Niccolò da Borbona, in Muratori LA, Ref. 4. col. 874.
 22. Campano GA, Ref. 3. p. 141v.
 23. Mallegni F, Ricci S, Capecci G, *Biologia delle spoglie mortali di Braccio Fortebraccio da Montone (1368-1424)*. *Archivio per l'Antropologia e l'Etnologia* 2019;149:95-118.
 24. See: Malghem J, Vande Berg BC, Lecouvet FE, Maldague BE, Costal cartilage fractures as revealed on CT and sonography. *Am J Roentgenol* 2001;176(2):429-432. DOI:10.2214/ajr.176.2.1760429, Nummela MT, Bensch FV, Pyhälä TT, Koskinen SK, Incidence and Imaging Findings of Costal Cartilage Fractures in Patients with Blunt Chest Trauma: A Retrospective Review of 1461 Consecutive Whole-Body CT Examinations for Trauma. *Radiology* 2018;286(2): 696-704.
 25. See Ref. 24.
 26. The bolts show a high penetration capacity despite the rather low kinetic energy (<100 J) due to the high sectional density and the split-like penetration mechanism. The wide range of resulting lesions depends on the type of arrow and tip used. Karger B, Bratzke H, Groß H, Lascowski G, Lessig R, Monticelli F, Wiese J, Zweihoff RF, Crossbow homicides. *Int J Legal Med* 2004;118:332-336.
 27. Compare the lesion with the ones described in Kaufmann MH, Whitaker D, McTavish J, Differential diagnosis of holes in the calvarium: application of modern clinical data to palaeopathology. *J Archaeol Sci* 1997;24:193-218 and Facchini F, Rastelli E, Belcastro

- MG, Peri mortem cranial injuries from a medieval grave in Saint Peter's cathedral, Bologna, Italy. *Int J Osteoarchaeol* 2008;18:421-430. A good example of a post-mortem head injury is the famous hole in the skull of Pope Celestine V, which fueled fanciful legends for centuries. See Ventura L, The mysterious hole in the skull of Pope Celestin V. *Forensic Sci Med Pathol* 2021;17:529-533.
28. See Ref. 3. c. 2v.
 29. For further insights into the effects of lime on corpses, refer to the following: Blanchard P, Castex D, Coquerelle M, Giuliani R, Ricciardi M, A mass grave from the catacombs of Saints Peter and Marcellinus in Rome, second-third century AD. *Antiquity* 2007;81:989-998; D'Errico S, Turillazzi E, Pomara C, Fiore C, Monciotti F, Fineschi V, A novel macabre ritual of the Italian mafia ('ndrangheta). Covering hands with gloves and burying the corpse with burnt lime after execution. *Am J Forensic Med Pathol* 2011;32:44-46; Kim MJ, Oh CS, Lee IS, Lee BH, Choi JH, Lim D-S, Yi YS, Han W-J, Kim Y-S, Bok GD, Lee SD, Shin DH, Human mummified brain from a medieval tomb with lime-soil mixture barrier of the Joseon dynasty, Korea. *Int J Osteoarchaeol* 2008;18:614-623; Schotsmans EMJ, Van de Voorde W, Concealing the crime: the effects of chemicals on human tissues. In: Schotsmans EMJ, Márquez-Grant N, Forbes SL (eds), *Taphonomy of human remains: forensic analysis of the dead and the depositional environment*. John Wiley & Sons, 2017;335-351.
 30. To date, the oldest documented example of a body embalmed in Aquila was Saint Bernardino da Siena, who died in 1444. He represented the leading figure of the Franciscan Observance in central Italy. The location of these friars' bodies in Abruzzo region since 1415 is documented in Ventura L, From L'Aquila to Europe. Bodies and burials of the Franciscan Observance leading figures, 600 years after its introduction in Abruzzo region (1415). *Pathologica* 2015;107:215. A good example of body preservation through lime is represented by the Blessed Jean Bassand, a French Celestine monk who died in Aquila in 1445. The preliminary studies on his mummy were published in: Ventura L, Gaeta R, The facial skin eruption in the mummy of the Blessed Jean Bassand (c. 1360-1445). *Med Hypotheses* 2020;144:110003. doi: 10.1016/j.mehy.2020.110003; Ventura L, Bruno F, Barile A, Masciocchi C, Bilateral fabella in the mummy of the Blessed Jean Bassand (c. 1360-1445). A unique description in ancient human remains. *Int J Osteoarchaeol* 2021;31:1276-1279. doi: 10.1002/OA.3019; Giuliani A, De Benetti M, Bruno F, Barile A, Traversari M, Ventura L, Le monete nel corpo del Beato Jean Bassand (c. 1360-1445). *Storiografia e analisi dei reperti*. *Med Secoli* 2023;35(3):143-192. In 1479, the body of the Augustinian monk Andrea da Montereale was eviscerated and artificially embalmed in Montereale, about 30 km north-west of Aquila, as reported in Ventura L, Traversari M, Sabatini N, Cilli E, Telera G, Ripani M, A retrospective study on the artificial mummification of the Blessed Andrea da Montereale (AD 1479). *Med Histor* 2022;6(2):e2022016.

Orcid Luca Ventura: <https://orcid.org/0000-0002-1526-3941>

Orcid Mirko Traversari: <https://orcid.org/0000-0002-6376-7626>

Orcid Federico Bruno: <https://orcid.org/0000-0002-1444-2585>

Orcid Alessandro Ricci: <https://orcid.org/0000-0003-2018-2940>