Neurosurgical developments of Thierry de Martel (1875–1940), French neurosurgery pioneer, during World Wars I and II

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Following France’s entry into World War I on August 3, 1914, Thierry de Martel (1875–1940), the French neurosurgery pioneer, served on the front line and was wounded on October 3, 1914. He was then assigned as a surgeon in temporary hospitals in Paris, where he published his first observations of cranioencephalic war wounds. In 1915, de Martel met Harvey Cushing at the American Hospital in Neuilly, where de Martel was appointed chief surgeon in 1916. In 1917, he published with the French neurologist Charles Chatelin a book (Blessures du crâne et du cerveau. Clinique et traitement) with the aim to optimize the practice of wartime brain surgery. This book, which included the results of more than 5000 soldiers with head injuries, was considered the most important ever written on war neurology at that time and was translated into English in 1918 (Wounds of the Skull and Brain; Their Clinical Forms and Medical and Surgical Treatment). In this book, de Martel detailed the fundamentals of skull injuries, classified the various cranioencephalic lesions, recommended exploratory craniectomy for cranioencephalic injuries, recommended the removal of metal projectiles from the brain using a magnetic nail, and advocated for the prevention of infectious complications. Between the World Wars, de Martel undertook several developments for neurosurgery in France alongside neurologists Joseph Babinski and Clovis Vincent. Following France’s entry into World War II on September 3, 1939, de Martel took over as head of the services of the American Hospital of Paris in Neuilly. He updated his work on war surgery with the new cases he personally treated. Together with Vincent, de Martel presented his new approach in “Le traitement des blessures du crâne pendant les opérations militaires” (“The treatment of skull injuries during military operations”) on January 30, 1940, and published his own surgical results in April 1940 in “Plan d’un travail sur le traitement des plaies cranio-cérébrales de guerre” (“Work Plan on the Treatment of Cranio-Cerebral Wounds of War”), intended for battlefield surgeons. On June 14, 1940, the day German troops entered Paris, de Martel injected himself with a lethal dose of phenobarbital. Thierry de Martel played a central role in establishing modern neurosurgery in France. His patriotism led him to improve the management of wartime cranioencephalic injuries using his own experience acquired during World Wars I and II.

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Thierry de Martel (1875–1940), whose full name was Thierry Jean-Marie François de Martel de Janville, owes his international fame to the developments he undertook for neurosurgery (Fig. 1). He developed neurosurgical tools like the wire saw guide in 19081 and a motorized trephine with an automatic declutching mechanism in 1910 (Fig. 2).2 He introduced into France techniques he learned in the United States (US), such as ventriculography, retrogasserian neurotomy, and posterior medianula cordotomy.3 He codified the use of the seating position and of local anesthesia in cranioencephalic surgery:4,5 “He did much to fortify Harvey Cushing in his use of local anesthesia for operations on the brain, and to minimize bleeding, he introduced the sitting posture for the patient.”6

During World Wars I (WWI) and II (WWII), this pioneer of neurosurgery also put his patriotic energy at the service of France and his surgical skills at the service of neurosurgery. We present how the neurosurgical experience acquired on the battlefield led de Martel to improve the management of cranioencephalic war injuries.
The Early Years of Neurosurgery in France (1909–1914)

Thierry de Martel was born on March 7, 1875, in Maxéville (Meurthe et Moselle, France). His parents were Count Marie François Roger de Martel de Janville (1848–1920) and Sybille Aimée Marie-Antoinette Gabrielle de Riquetti de Mirabeau (1849–1932). His mother was a novelist who wrote under the pseudonym Gyp. Thierry de Martel had one brother, Aymar (1873–1900), and one sister, Nicole (1877–1968). He was a very athletic man who practiced cycling, boxing, and rugby. He won the first French rugby championship in 1896 with the Olympique Club.

In 1899, he started his medical studies at the Faculty of Medicine of Paris, and he was appointed as a resident of surgery in 1902. He graduated in 1907 and became a general surgeon at the Salpêtrière Hospital in the service of Professor Paul Segond. In 1911, de Martel began his private surgical practice in Paris. To cover the costs of his

FIG. 1. A: Thierry de Martel in 1914, while serving as a second-class medical assistant in the 292nd Infantry Regiment. Reproduced with the kind authorization of L'Illustration (www.lillustration.com). B: A portrait of de Martel drawn in 1915 by the artist Marie-Louise-Catherine Breslau (1856–1927). Public domain. C: Thierry de Martel, riding a bicycle in 1914, near Fontenoy (Aisne, France), where he was wounded on October 3, 1914, by shrapnel in the thigh during the First Battle of the Aisne. D: Upon recovering, de Martel (left) received the Chevalier de la Légion d’Honneur (Legion of Honor) in the presence of Harvey Cushing (right). He was awarded this highest French decoration in December 1914. E: Thierry de Martel in 1915 (center, wearing a white hat) practicing general war surgery on the hospital ship Charles Roux in the Strait of Gallipoli in the Mediterranean Sea. Panels C–E from Denet JC. M. le Dr Thierry de Martel. Pallas. 1939;18:3-14. Public domain. Source: gallica.bnf.fr, National Library of France.
Thierry de Martel performed his first neurosurgical operations thanks to the trust of neurologist Joseph Babinski: an intracranial meningioma in 1909, two cerebral gliomas in 1910, and a spinal meningioma in 1912. In 1910, de Martel went to London every week to attend Victor Horsley’s operations at Queen’s Square Hospital. He readily admits the importance that Victor Horsley had in his neurosurgical training: “I have on several occasion heard de Martel acknowledge his great debt to Sir Victor Horsley, whom he regarded as the pioneer of neurosurgery … he stated many time that Horsley had been his inspiration and that he had learnt his neurosurgery from him.”

In 1913, he reported his neurosurgical activity to the Society of Neurology (25 operated cases, 68% survival), and he was the only French surgeon to report personal neurosurgical experience at the 17th International Congress of Medicine in London. In 1914, de Martel had a nationwide reputation as a general surgeon and became the main surgeon to perform neurosurgery in France.

**World War I (1914–1918)**

Following France’s entry into WWI on August 3, 1914, Thierry de Martel was incorporated into the 292nd Infantry Regiment as a second-class medical assistant. Acting on the front line during the First Battle of the Aisne near Fontenoy (Aisne, France), he was wounded on October 3, 1914. The regimental diary reports: “Mr. Martel de Janville’s Aide-Major Physician, while going into the line of fire to treat the wounded, he was himself wounded by shrapnel in the thigh; he continued despite the wound to treat the wounded of his battalion and only consented to enter the ambulance when all his wounds were treated.”

Thierry de Martel was awarded the Chevalier de la Légion d’Honneur (Legion of Honor), the highest French decoration, created by the French Emperor Napoleon I, in December 1914 for his exceptional involvement in the care provided to soldiers, which was reported in the regimental diary reports.

The ambulance cars left with the doctors de Martel, Laroche, the accounting officers Dillon and André, and brought back the greatest number of wounded who had remained on the battlefield…. A few forgotten had remained lying in the fields were collected only the next day and cared for with tireless devotion by Doctor de Martel and his staff…. Around 6 a.m. the German howitzers persisted in demolishing and burning all that remained of the Tower farm, pinning the defenders in place. These shells set fire to the buildings occupied by the wounded. Doctor de Martel de Janville, helped by his staff and a few men of good will, very quickly pulled all the wounded from the flames.

While he was recovering, de Martel was assigned as a surgeon in two temporary hospitals in Paris (the temporary hospital Chaptal, hosted in Collège Chaptal, Boulevard des Batignolles; and the Russian Hospital, Rue du Faubourg Saint Honoré) created because of the war. There he published his first surgical results of cranioencephalic war wounds, among the earliest ever reported during WWI. In May 1915, de Martel visited the American Hospital in Neuilly to see the neurosurgical practice of the North American teams. There he met Harvey Cushing, who reported: “Then back to find de Martel lunching at the ambulance with Heitz-Boyer and du Bouchet, and after a hurried bite we show them some of our cases—de Martel much taken with the wounds, some of which are pretty good, and he wants to know the secret of making ‘invisible’ scars.”

After recovery, in August 1915, de Martel was assigned as a surgeon on the hospital ship Charles Roux, which left for the Mediterranean Sea to defend the Strait of Gallipoli (Les Dardanelles in French). There he tirelessly practiced general war surgery in difficult conditions. Stricken with malaria, he was repatriated to France in March 1916.
Once he recovered later that month, de Martel was assigned to a temporary hospital in Paris (temporary hospital of the Panthéon, Rue Lhomond) and appointed the chief surgeon at the American Hospital in Neuilly until the end of the war.15 Also in 1916, he faced the death of his only son, Aymar, a volunteer, who died on July 14 on the front line at the age of 18.7

Throughout the war, de Martel recorded his own observations and surgical results of war wounds. With the French neurologist Charles Chatelin, he published two books aimed at rationalizing and optimizing the practice of brain surgery in the context of war: Blessures du crane et du cerveau. Clinique et traitement6 (Wounds of the Skull and Brain; Their Clinical Forms and Medical and Surgical Treatment) in 1917 and Traitement opératoire des plaies du crâne20 (Operative Treatment of Skull Wounds) in 1918 as a part of the book collection “Précis de Médecine et de Chirurgie de guerre” (Medicine and war surgery) (Fig. 3). Blessures du crane et du cerveau, which included the results of more than 5000 soldiers with head injuries, was considered the most important ever written on war neurology at that time. The success of this book led to an English translation in 1918: Wounds of the Skull and Brain; Their Clinical Forms and Medical and Surgical Treatment.21 In this book, de Martel detailed the fundamentals of the management of skull injuries:5

The preparation of the operating field must be very careful and, above all, very early. It must take place at the aid station…. A dry bandage will be carefully applied to avoid any new contamination during transport of the injured…. The injured person will be transported very gently and with as few jerks as possible to a point where he can be operated on and hospitalized…. There is generally no urgency to operate on skull injuries, they will all benefit from being transported immediately to a hospital…. The examination of the head injury makes it possible to prejudge the extent of the cerebral lesions and to note the improvement or the aggravation of the injured person’s condition…. It is necessary that the surgeon who operated on a wounded skull follow him for a long time. By following their wounded, they would have seen that many of them die late, after having been, for a few weeks, apparently healed.

Thierry de Martel described and classified the various craniocerebral lesions: “1) tangential wounds; 2) wounds in which the bullet entered the skull and came out almost immediately; 3) wounds in which the bullet struck the skull normally but without penetrating it; 4) cases in which the skull is crossed through by a bullet; 5) cases in which the skull is dented by a large projectile; 6) cases in which the skull and brain are plowed to a great extent and depth”5 (Fig. 4). He also insisted on the risks of infectious complications and tried to prevent them (Fig. 5):5

Wearing a helmet eliminates the presence in the wound of remnants of the kept, which are a major cause of infection…. Care must be taken that men wear their hair very short. In this way, the soiling of the wound by long hair is avoided and the shaving and cleaning of the scalp is made much easier…. We must not forget the very great danger of opening and infecting the ventricular cavity…. How does the removal of a large part of even infected bone around the fracture help the injured person? These wounded never die of osteomyelitis of the skull. There is no danger there…. The immediate danger is almost exclusively meningitis, and against meningitis, the injured person’s natural defenses are much more effective than the illusory help of surgery…. Please note that the bullet is aseptic right until it comes into contact with the tissues as it was brought to a temperature of several hundred degrees a few moments before…. The surgeon must take care of treating the meningeal and cerebral lesions, taking particular care not to destroy the adhesions that already exist between the dura mater and the brain…. It is necessary to limit the work window through the dura wound as it is without enlarging it, and if one is obliged to enlarge it, it must then be sutured…. It’s good to leave a drain there.

Thierry de Martel’s innovative ideas, such as the recommendation of exploratory craniectomy for craniocerebral injuries or the removal of shrapnel and metal projectiles from the brain using a magnetic nail, published as early as 1917, were adopted by Harvey Cushing in his later publications.22 Indeed, Harvey Cushing incorporated surgical techniques he observed in France from European surgeons, including de Martel, who advocated the complete shaving of the head, the use of local anesthesia, the use of a bone flap to expose the damaged brain, and the use of an electromagnet to extract metallic foreign bodies from the brain.22 Since their meeting in 1915 at the American Hospital in Neuilly, de Martel and Cushing maintained a friendly relationship and together attended the military parade organized in Paris on July 4, 1918, for the US Independence Day. Harvey Cushing wrote: “No possibility of seats, but he [de Martel] had secured three tickets for standing room reserved in a balcony.”23

The Advent of Modern Neurosurgery in France (1918–1939)

After WWI, Thierry de Martel resumed his civil surgical activity in his Parisian clinics and became an internationally recognized surgeon. In addition, he developed neurosurgery in France alongside the neurologist Clovis Vincent (1879–1947). Marcel David summarized the emulation between de Martel and Vincent, which gave birth to neurosurgery in France: “Both of them, under the aegis of Babinski, for years, were to form a medico-surgical symbiosis which was to be the starting point of French neurosurgery then in its infancy. Martel strove tirelessly to adapt his prodigious gifts as an operator to the requirements of nerve surgery. He devoted a large part of his activity and his personal resources to it.”24 At the end of his life, Joseph Babinski considered his greatest contribution to neurology to be his having pointed the way to de Martel and Vincent: “Le signe, oui. Mais ce n’est pas ce que j’ai fait de mieux. Le mieux, j’ai indiqué la voie à Martel et à Vincent” (“What I have done best? The sign, yes. But it’s not the best I’ve done. Best of all, I showed Martel and Vincent the way”).25 To meet the requirements of neurosurgical practice, de Martel traveled to the US several times.24,26 He summarized his travels as follows: “Discovered and perfected by Cushing, brain surgery has made immense progress. It is true that the Americans, in this as in everything, show an admirable organization. They went so far as to ‘standardize’ the various departments of the medical profession.”26 Clovis Vincent became a neurosurgeon with the help of de Martel, who kept repeating
to him: "Knowing the brain as you know it, it is you who should operate in my place. You will learn surgery faster than I neurology." Together, they created a French neurosurgical school.

World War II (1939–1940)

Following France’s entry into WWII on September 3, 1939, de Martel took over as head of the services of the American Hospital in Neuilly, as well as the service

of the Laennec Hospital in Paris, both acting as military hospitals.

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Wishing to improve the survival of French soldiers, de Martel resumed his work on war surgery, updating it with new cases he personally treated. Together with Vincent, de Martel presented his new approach in “Le travail sur le traitement des plaies cranio-cérébrales de guerre”29 (“Work Plan on the Treatment of Craniocerebral Wounds of War”), intended for military surgeons on the battlefield. This work plan updated previous recommendations established during WWI and codified the care chain:29

Two questions to solve first: Where and when should these injured people be operated on? … The cranio-cerebral wound can wait. Not too much, however: thirty-six hours at most. It benefits from being operated under conditions of real stability…. The doctor in charge of triage must be chosen among the most experienced and knowledgeable…. In the presence of a polytrauma person, what should be done? In general leaving the skull for last, often having an important timespan which will be used to tone up and warm the injured person, sometimes to transfuse him with blood…. The degree of infection varies with different factors. One of the most important is the nature of the projectile. Smooth bullets are not very infective. Shrapnels are on the other hand highly infective…. A foreign body near the ventricle is a great danger…. Brain injured can die: 1) because they suffer from a lesion of the vital brain … 2) because an infectious encephalitis develops more or less late with all its consequences … 3) because of a series of hemodynamic disorders secondary to the injury and to the phenomena of aseptic necrosis that it entails.

This refinement of medical triage was a worthy continuation of a French tradition initiated by Baron Dominique Jean Larrey (1766–1842), a surgeon in the Napoleonic army and father of modern medical triage.30 At the same time, the first results of the patients wounded in WWII and treated according to de Martel’s method were published:29

64 cases of cranio-cerebral wounds were operated on at the American hospital by Dr de Martel or under his immediate direction and by the methods he advocated. Of these 64 injured: three died immediately after the operation, but these were three injured who fell into the category of those considered to be suffering from a fatal injury…. Two other patients died of acute meningitis…. Finally, one injured suffered two months after his trepanation, a cerebral abscess with meningeal reaction…. All the other injured, i.e. 58 cranio-cerebral wounds, left were discharged from the hospital in good health.

The Death of Thierry de Martel

In June 1940, the French defeat was imminent. On June 11, Paris was declared an open city. After failing to join a group to fight for and defend the city, de Martel asked William Bullit, US ambassador in France, if his presence in Paris was still necessary. William Bullit replied that it was preferable that the chief surgeon of the American Hospital in Neuilly remained at his post.7 Thierry de Martel felt deeply dejected: “I can no longer live. My only son was killed in the last war…. Until this one, I wanted to believe that he had died to save France…. And now France in turn is lost…. Everything for which I lived will disappear … I can’t take it anymore.”31 On June 12, 1940, during his last professional appearance at a session of the Société de Chirurgie, de Martel expressed his bitterness toward his medical colleagues, whom he considered not involved enough in the treatment of the war wounded: “The other patients are in perfect condition, always with excellent shreds that I will only be able to show off to the Germans, since no Frenchman has come to see these operations that I would have liked so much to present to some of you.”32

On June 14, 1940, the day German troops entered Paris,
Ambassador William Bullit received a telegram from de Martel: “I promised you not to leave Paris. I did not say if I would remain in Paris alive or dead. To remain living in Paris would be a cashable check for our adversaries. If I remain here dead, it is a check without funds to cover it. Adieu. Martel.” By the time the ambassador had read the telegram, de Martel had already left. At dawn, after having shaved and perfectly dressed, and after having read Victor Hugo’s *Hernani*, of which he underlined the verse “Puisqu’il faut être grand pour mourir, je me lève” (“Because one must be great to die, I rise”), de Martel injected himself with a lethal dose of phenobarbital.

The death of de Martel spread internationally, and many medical journals paid tribute to him. The *British*
Medical Journal reported: “The tragic death by suicide of Thierry de Martel, on the day of which the Germans entered Paris, robs France of one of her most distinguished sons…. He will long be grateful for the brave and distinguished gentleman who happened also to be a surgeon of international repute.” The journal Archives of Neurology and Psychiatry reported: “Dr de Martel was an ingenious operator and an independent thinker…. Perhaps the two things for which de Martel was most famous from the neurosurgical standpoint were his advocacy of local anesthesia and the employment of the sitting posture in cranial operations. In both of these innovations he was the pioneer…. The German occupation of the French capital was apparently too much for a man of de Martel’s intense patriotic spirit.”

Conclusions

Thierry de Martel, like Clovis Vincent, played a central role in establishing modern neurosurgery in France. His patriotism led him to improve the survival of wounded soldiers by codifying the management of wartime cranioencephalic injuries in the light of his experience acquired during WWI and WWII. In the words of René Leriche, as a final tribute to de Martel, “We have only to be silent and salute, with emotion, with respect, the one who, in full possession of himself, did not want to survive the mourning of what he had the most loved: France…. We all learned a lot from him. There is not one of us of whom he has not been master in some way. It is strict justice to proclaim it.”

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References

28. de Martel T. Le traitement des blessures du crâne pendant les opérations militaires. L’informateur Médical. 1940;767:2.
34. Une des gloires de la science française, le Dr Thierry de Martel s’est donné la mort le lendemain de l’entrée des Allemands à Paris. *Le Petit Marocain*. 1940;18:1.

**Disclosures**

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**Author Contributions**

Conception and design: Pallud. Acquisition of data: Pallud. Analysis and interpretation of data: Pallud. Drafting the article: Pallud, Simboli. Critically revising the article: all authors. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Pallud. Administrative/technical/material support: Pallud. Study supervision: Pallud.

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