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REVIEW

THE BALKAN FRAME REVISITED: ORIGINS AND MISNAMING OF A TRACTION APPARATUS

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Abstract

The term "Balkan Frame," also known as the Balkan splint or Balkan traction frame, has long been erroneously attributed to the Balkan War of 1912–1913. In fact, it was devised in 1911 by Vatroslav Florschütz (1879–1967) in Osijek (Croatia) to suspend the lower limb using a sheet attached to a single rigid pole for treating compound femoral fractures. Florschütz presented his method at the First Congress of Yugoslav Surgeons in Belgrade in 1912. In 1915, the original device was modified at the American Hospital in Juilly (France) into a portable overhead apparatus with iron bars, a movable pulley, and later, a wooden trolley. Although this version differed markedly from Florschütz's design, the term "Balkan Frame" endured. Henry Lyle (1874–1947) later proposed renaming it the Whitney–Juilly Frame in honor of Gertrude Vanderbilt Whitney (1875–1942), the hospital's founder, while Joseph A. Blake (1864–1937) further improved its suspension. These changes increased portability and patient comfort while preserving its suspension and traction principles. Correcting this misattribution

Résumé

Le Cadre Balkan réévalué: origines et mauvaise attribution d'un appareil de traction

Le terme « Cadre Balkan », également appelé attelle balkanique ou cadre de traction balkanique, a longtemps été attribué à tort à la guerre balkanique de 1912–1913. En réalité, il a été mis au point en 1911 par Vatroslav Florschütz (1879–1967) à Osijek (Croatie) pour suspendre un membre inférieur au moyen d'un drap fixé à un poteau rigide, afin de traiter les fractures ouvertes du fémur. Florschütz présenta sa méthode lors du premier congrès des chirurgiens yougoslaves à Belgrade en 1912. En 1915, le cadre initial fut modifié à l'Hôpital Américain de Juilly (France) en un appareil portatif doté de barres métalliques, d'une poulie mobile et d'un chariot en bois. Bien que cette version diffère notablement du dispositif original, l'appellation « Cadre Balkan » s'est maintenue. Henry Lyle (1874–1947) proposa de le renommer Whitney–Juilly Frame, en hommage à Gertrude Vanderbilt Whitney (1875–1942), fondatrice de l'hôpital, tandis que Joseph

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supports historical accuracy and reinforces scholarly rigor in orthopedic knowledge.

Keywords: eponyms, fracture fixation, history of medicine, orthopedic devices, traction.

A. Blake (1864–1937) améliora encore la suspension. Ces évolutions ont optimisé portabilité et confort, tout en conservant les principes de traction et de suspension. Rectifier cette attribution contribue à l'exactitude historique et à la transmission rigoureuse du savoir en orthopédie.

Mots-clés: dispositifs orthopédiques, éponymes, histoire de la médecine, ostéosynthèse, traction.

Introduction

The history of orthopedic innovation is closely linked to wartime demands, trauma care, and the international exchange of best practices[1]. Among the numerous devices modified under such conditions, the so-called Balkan frame—alternatively known as the Balkan beam, splint, or traction apparatus—stands out as a widely adopted orthopedic tool whose name has obscured its actual origins[2,3].

Contrary to popular belief, the "Balkan frame" was not developed during the Balkan Wars of 1912–1913. Instead, it was created in 1911 by Dr. Vatroslav Florschütz (1879–1967), a Croatian surgeon based in Osijek. He designed the frame to manage gunshot-induced femoral fractures by employing a system of vertical and horizontal traction—well before it was widely adopted in military setting, which obscured his authorship[4,5]. This misattribution likely occurred due to the device's rapid deployment in battlefield settings, as evidenced by military reports, field manuals, and photographs[6,7]. The broad dissemination of these military representations overshadowed the original publication by Florschütz and his subsequent formal presentation. Correcting such historical inaccuracies holds importance not only for historiography but also reinforces professional accuracy within medical education and clinical practice.

Trained in Innsbruck under Professor Viktor von Hacker (1852–1933) and later serving as the deputy head of surgery in Osijek, Croatia, Florschütz designed a suspension system intended specifically for managing femoral fractures. He published his innovative method in an article titled "Treatment of Bone Fractures of the Upper and Lower Limbs" in *Liječnički Vjesnik* (Physicians' Herald) in 1911, documenting eleven cases along with radiographs, mechanical drawings, and clinical photographs[8]. The design was officially presented at the First Congress of Yugoslav Surgeons held in Belgrade in 1912[4].

The term "Balkan frame" gained notoriety following its deployment within field hospitals during the Balkan Wars[9]. Military physicians, including the prominent Croatian surgeon Julije Budisavljević (1882–1981), rapidly adopted Florschütz's technique and praised its simplicity, hygienic advantages, and clinical effectiveness. Nevertheless, these wartime associations quickly eclipsed the acknowledgment of its true inventor[4]. This article revisits the original roots of the Balkan frame, its wartime and postwar modifications, and discusses the implications of its ongoing misattribution.

Materials and Methods

A historical-documentary research method was used to explore the origin, evolution, and nomenclature of the Balkan frame. Searches in PubMed/MEDLINE, Google Scholar, and archival databases were performed utilizing the keywords "Balkan frame", "Balkan traction," "Balkan splint" and "Balkan suspension". No temporal restrictions were imposed.

From a total of 132 screened sources, sixteen were selected for detailed examination based on their historical relevance, specificity to the Balkan frame or related traction devices, and importance for orthopedic practice or medical terminology based on their historical significance. The sources included peer-reviewed orthopedic literature, World War I surgical manuals, and medical dictionaries published in English, French, and German. Emphasis was placed specifically on materials detailing technical specifications, clinical utility, and the persistence of the terminology. Data were analyzed thematically.

Results

After Florschütz introduced his traction-suspension apparatus in 1911 and formally presented it at the First Congress of Yugoslav Surgeons in Belgrade in 1912, he implemented the device in battlefield conditions at Belgrade's Reserve Hospital during the Second Balkan War in 1913. His meticulous clinical records and photographs documented the apparatus's ability to stabilize fractures, promote hygienic practices, and facilitate accessible wound care management[10]. Other surgeons rapidly adopted the system,



Figure 1. U.S. Army Hospital Center, Beau Desert, France, c. 1918. A wounded soldier in bed using a suspension and traction apparatus referred to as a Balkan frame. Courtesy of the National Library of Medicine, Maryland.

citing its effectivenss in promoting muscle relaxation, preventing pressure sores, and significantly improving patient outcomes[4].

As World War I progressed, orthopedic innovation accelerated further. In 1917, Florschütz's technique received formal recognition during a military medical congress held in Lemberg (today Lviv, Ukraine), at the time part of the Austro-Hungarian Empire. Concurrently, numerous wartime refinements and adaptations emerged across various military hospitals (**Fig. 1**). At a base hospital in France, John Maurice Harman Campbell (1891–1973) introduced a rigid iron splint modeled after Jones's abduction frame, initially developed by Sir Robert Jones (1857–1933), a pioneer of British orthopedic surgery, to treat shoulder gunshot[11]. Campbell's splint improved limb positioning, patient comfort, dressing accessibility, and notably reduced sepsis.

Also in 1917, Robert Bayley Osgood (1873–1956) developed flexible combinations of Thomas and Jones splints designed specifically to maintain upper limb abduction in ambulatory patients, thus preserving patient mobility and comfort[12]. In 1918, George Albert Moore (1878–1958) introduced a jointed Thomas-Hodgen splint that allowed dynamic traction and controlled knee flexion, significantly improving outcomes in septic femoral fractures and reducing the necessity of post-recovery interventions[13]. Drawing upon his experiences at the U.S. Army Base Hospital in Savenay, France—one of the principal American medical centers established during World War I—Hiram Winnett Orr (1877–1956) emphasized the standardized application of the Thomas splint and the Balkan frame, advocating precise anatomical alignment, procedural reproducibility, and early initiation of controlled motion[14].

The consolidation and refinement of these methods continued after the war. In 1919, Carleton R. Metcalf promoted the combined use of the Thomas splint with Balkan frame suspension, detailing the Pearson and Savenay techniques that advanced conservative fracture care and reduced the need for surgical intervention through standardized alignment methods[15]. Similarly, Sterling Bunnell later refined the application of the Thomas splint by introducing tongs, spring traction, and improved foot control techniques, thereby making splinting safer and more effective in both military and civilian orthopedic practice[16].

Meanwhile, at the American Ambulance Hospital in Juilly, France, Henry Hamilton Moore Lyle (1875–1947), a prominent military surgeon, developed a portable overhead apparatus featuring iron crossbars, pulleys, and a trolley mechanism (**Fig. 2**)[17]. Although he proposed the term "Whitney–Juilly frame" to reflect the institutional setting and the funding provided by Gertrude Vanderbilt Whitney, the term "Balkan frame" had already become widely

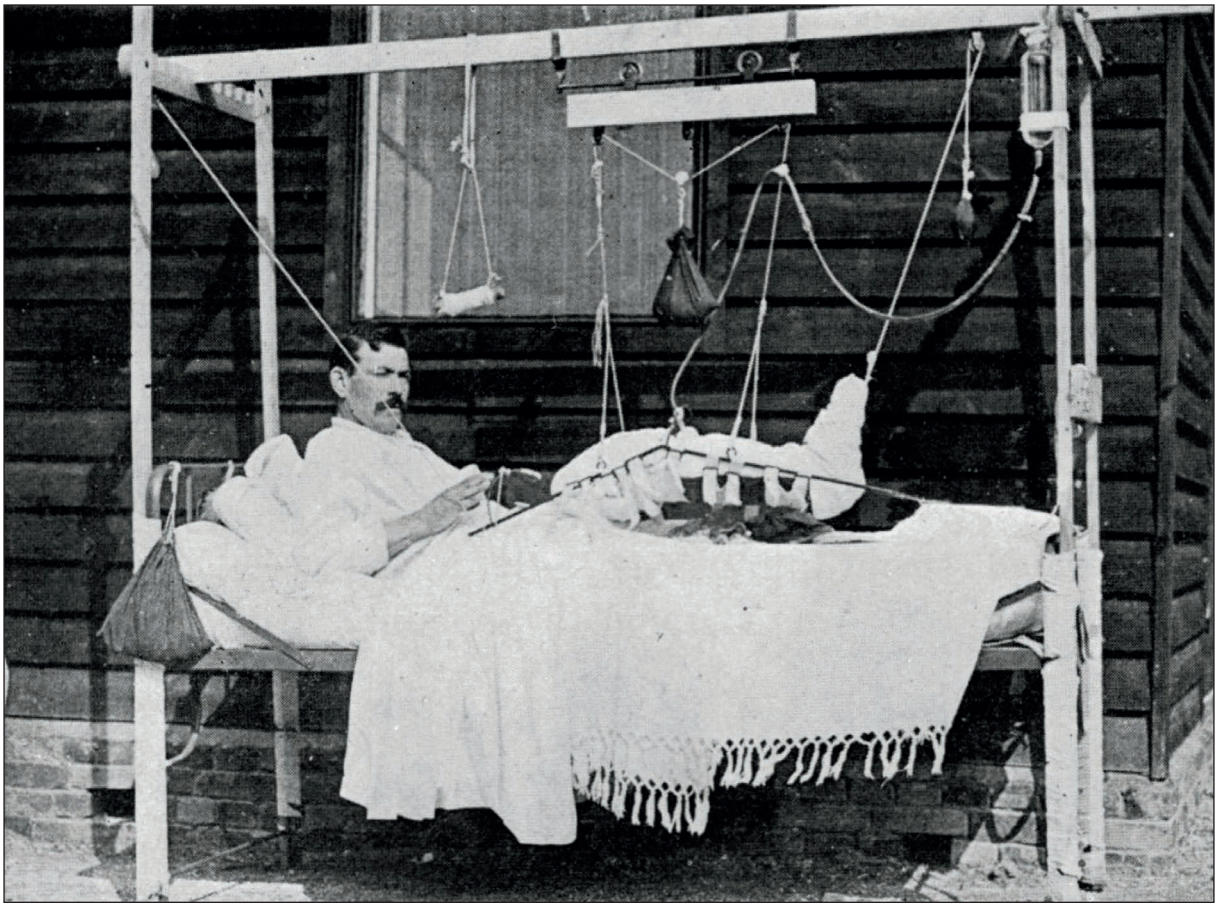


Figure 2. Whitney–Juilly frame by Dr. Henry H. M. Lyle (1920), featuring balanced suspension and Dakin's solution delivery for wound care during World War I[17].

adopted[17,18]. In contrast to Florschütz's original wooden and static model, Lyle's apparatus incorporated iron crossbars, pulleys, and a mobile trolley, significantly enhancing portability, balance, and patient accessibility in field conditions. Additional enhancements came from Dutch surgeons Leendert Marie Metz (1871–1945), Willem Noordenbos (1875–1954), and Johannes Esser (1877–1946), whose modifications illustrated the international exchange of battlefield orthopedic practices[3].

By the interwar period, the Balkan frame had become a standard trauma care tool, particularly throughout Europe, and was increasingly adopted by military and civilian hospitals across North America and Asia, frequently alongside the Thomas splint. Subsequent innovations included Ryan's adaptation for tuberculosis treatment[19], Foucar's foldable frame design[20], Allen and Basu's application for spinal fractures in India[21], and Norton and Ilfeld's postoperative adaptation for hip surgery enabling early mobilization[22] (**Table 1**).

Despite efforts to correct its attribution, the term "Balkan frame" became firmly entrenched in medical literature and standard reference works, including *Stedman's Medical Eponyms*[2], *Dorland's Illustrated Medical Dictionary*[23], and the *Oxford Dictionary of Nursing*[24]. French and German equivalents—*cadre Balkan* and *Balkanrahmen*—appear in major medical dictionaries, typically without historical context or clarification[25,26].

Though largely superseded by modern fixation systems, the Balkan frame remains relevant in pediatric orthopedics, preoperative stabilization in resource-limited settings, and medical education. Its biomechanical principles continue to influence contemporary hospital equipment design. The frame's adaptability was further demonstrated when Robert Morris Hardaway (1916–2019) created a steel cradle designed specifically to fit into Balkan frame slots to aid burn exposure treatments, extending suspension principles into burn care, ensuring patient stability, and improving wound accessibility[27].

Discussion

The Balkan frame exemplifies how clinical devices emerge from wartime circumstances, traverse international borders, and subsequently become

Table 1. Historical Innovations and Early Modifications of the Balkan Frame and Related Traction Devices (1911–1957)

Author	*Year*	*Key innovation or adaptation*	*Significance for Balkan Frame Evolution & Joint Care*
Florschütz[8]	1911	Traction-suspension method illustrated with radiographs and drawings	Foundational design; introduced biomechanical principles and visual documentation of outcomes
Campbell[11]	1917	Designed a rigid abduction splint for gunshot wounds of the shoulder based on Jones's frame.	Improved comfort and alignment; allowed easier transport and treatment of sepsis.
Osgood[12]	1917	Created combinations of Thomas and Jones splints for shoulder injuries in ambulatory settings.	Enabled flexible splint setups for field mobility and functional recovery.
Moore[13]	1918	Jointed the Thomas-Hodgen splint to allow knee flexion and patient-directed traction.	Promoted early motion, improved outcomes in septic femur fractures.
Metcalf[15]	1919	Promoted Thomas splint with Balkan frame suspension; detailed Pearson and Savenay techniques.	Advanced conservative fracture care, reducing surgery through standardized alignment methods.
Lyle[17]	1920	Invented the true portable suspension frame later misattributed as the "Balkan frame."	Revolutionized fracture care during WWI with practical, portable overhead support system.
Orr[14]	1920	Advocated strict Thomas splint protocols and proper Balkan frame use for suspension (not traction).	Reinforced effective field-to-hospital fracture care; avoided deformity through standardization.
Bunnell[16]	1921	Refined Thomas splint application with tongs, spring traction, and foot control methods.	Made splinting safer and more effective in both military and civilian orthopedic practice.
Ryan[19]	1929	Integrated a modified Bradford frame with a Balkan suspension frame for tuberculosis care.	Allowed toileting, traction, and limb positioning with minimal patient disturbance.
Foucar[20]	1936	Designed a foldable, single-unit Balkan frame adaptable to various hospital beds.	Improved accessibility and usability in general hospitals; easy to store and deploy.
Allen & Basu[21]	1938	Used a Balkan frame with strips for plaster jacket application under hyperextension.	Provided low-cost, efficient alternative for spinal fracture immobilization in resource-limited settings.
Norton & Ilfeld[22]	1938	Adapted Balkan frame to allow early motion and abduction in postoperative hip surgeries.	Boosted rehabilitation outcomes by enabling controlled, early limb motion.
Hardaway[27]	1957	Created a steel cradle fitting into Balkan frame slots for burn exposure treatment.	Extended suspension principles into burn care, ensuring patient stability and wound accessibility.

dissociated from their original contexts. Despite its name, it was not developed during the Balkan Wars but introduced by Florschütz in Osijek, Croatia, in 1911. His initial article, complete with radiographs and clinical analyses, laid the groundwork for international adoption.

Misattribution of origins is commonplace in medical terminology. Lyle's unsuccessful attempt to rename the modified apparatus illustrates how wartime improvisations become canonized, overshadowing individual innovation. Such misnaming undervalues Florschütz's achievements and underscores the necessity of epistemic recognition. Accurate historical attribution is not merely semantic; it is crucial for correct historiography.

Clinically, the Balkan frame significantly improved fracture management outcomes. Used alongside the Thomas splint, it helped reduce femoral fracture mortality during World War I from nearly 80% to under 20%[28]. Symbolically, however, its misnomer links a region historically marked by conflict to a method of healing—while at the same time obscuring the contribution of its original inventor. Notably, the core design principles of the Balkan frame continue to inform modern orthopedic traction equipment (**Fig. 3**).

Conclusion

The Balkan frame was not a wartime improvisation, but a structured orthopedic innovation devised by Vatroslav Florschütz in 1911. Its persistent misnaming, shaped by wartime circumstances and institutional inertia, has obscured his individual contributions and distorted the historical record. Correcting this attribution is vital not only for historical accuracy



Figure 3. A sample drawing of a suspension and traction apparatus still marketed as the Balkan frame by European medical device manufacturers in 2025. The image has been digitally enhanced for clarity using the Sora AI model.

but also for safeguarding professional integrity and orthopedic education today. Acknowledging the true origins of such devices models scholarly rigor for orthopedic trainees and underscores the global contributions that have shaped modern fracture management.

Author Contributions:

H.T., E.S.Y., and S.H.Y. contributed to the conceptualization and design of the study; H.T., E.S.Y., and S.H.Y. wrote the original draft; all authors participated in writing, reviewing, and editing the manuscript; and all authors have read and approved the final version of the manuscript.

Compliance with Ethics Requirements:

"The authors declare that they have no conflict of interest regarding this article."

"The authors further declare that all procedures and experiments described in this study comply with the ethical standards of the Declaration of Helsinki (1975), as revised in 2008(5), as well as with applicable national laws."

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