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CONTENTS

Editorial

Space Medicine: Preparing the Human Body for Interplanetary Travel

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In the stillness before humanity first ventured beyond Earth, a delicate inquiry stirred between heartbeats: could a human body withstand the harshness of space? From this profound wonder emerged the initial ideas of what would evolve into space medicine. In 1948, Hubertus Strughold—at the U.S. Air Force School of Aviation Medicine—introduced the term "space medicine," envisioning the medical framework essential for sustaining life outside our planet. His daring illustrations of airtight cabins, pressure suits, and "*Mars jars*" designed to replicate extraterrestrial atmospheres set the foundation for a discipline informed by both urgency and creativity.

That same year, the U.S. Air Force convened a symposium led by Brigadier General Harry Armstrong, where scientists and health professionals gathered to discuss numerous challenges, including cosmic radiation and the psychological impacts of isolation. This exchange—addressing concerns from solar flares to pilot health—seemed exotic to many, especially those who had tasted brief weightlessness in test aircraft. It paved the way for the establishment of a dedicated institution: the *Department of Space Medicine*, formed shortly thereafter. Concurrently, Soviet scientists were conducting similar research, launching animals into space, developing pressurized capsules, and laying the groundwork for Yuri Gagarin's orbital flight in April 1961. Gagarin's achievement confirmed a pivotal truth: humans could survive in space—but mere survival wouldn't be enough.

As the Gemini and Apollo programs advanced, medical inquiry became integral to every launch countdown. Researchers monitored astronauts for cardiovascular strain, tracked bone density and red blood cell fluctuations, and noted muscle atrophy. Then, in 1973, Skylab launched—a pioneering laboratory in orbit. Crews spent extended periods in space; medical teams documented space motion sickness, fluid shifts, cardiovascular deconditioning, and bone loss, turning hypotheses into tangible data.

Amid these historic milestones was Dee O'Hara, the first aerospace nurse for NASA. She provided compassionate care to the Mercury Seven, drawing their blood, soothing their anxieties, and establishing trust, always present during launches and landings. Her role transcended mere monitoring; she cultivated camaraderie. Throughout the Gemini and Apollo programs, she navigated trauma and victories, transforming a realm of machinery into a domain of human connection. After Skylab, she advanced protocols for studies on bed rest and preventative care that continue to shape research on spaceflight effects today.

Meanwhile, aboard the Mir space station, cosmonauts endured months—and even over a year—in orbit, exposing deeper insights into health challenges: significant muscle loss, sensorimotor disarray, spinal elongation, and psychological strain exceeding what any single aircraft could mitigate. Gennady Padalka and Valeri Polyakov achieved remarkable durations in space; Polyakov returned after 437 days, demonstrating that while biology may bend, it can also rebound.

As the Cold War eased, space medicine gained institutional strength. In 1997, NASA established the National Space Biomedical Research Institute to enlist scientists in unraveling risks and solutions for long-duration missions. Analog investigations like Mars-500 evaluated mental effects of confinement, while subsequent organizations like TRISH (Translational Research Institute for Space

Health) ensured that findings would benefit both astronauts and terrestrial healthcare.

International collaborations emerged: Japan conducted meticulous bed-rest and dietary research, while China's Tiangong station examined cardiovascular responses, skin cell behavior, and mental fatigue with advanced imaging. Telehealth integrated astronauts into virtual medical consultations, long before Earth's remote clinics adopted similar strategies. The International Space Station, continuously occupied for over two decades, has become a vital hub for studying disease mechanisms, aging, immunology, and various health issues, all under the unique conditions of microgravity.

A particularly significant innovation was developed by Patricia Cowings, who created an autogenic-feedback exercise to combat space motion sickness. This biofeedback training—addressing heart rates, blood pressure, and neural control—enabled astronauts to adapt more quickly, a reminder of the importance of holistic care in the face of physical science.

The ongoing evolution of space medicine—shaped by NASA archival experts like Doarn, researchers in space psychology, physicians aboard shuttle missions, and local healthcare providers—illustrates how the seeds sown in 1948 burgeoned into a vibrant field straddling Earth and the cosmos, blending empathy with empirical diligence.

As we now anticipate missions to return to Artemis, construct lunar habitats, and explore Martian environments, we embrace this legacy. Space medicine has transformed from a speculative notion into both a protector and guide: it safeguards physical and mental well-being against cosmic challenges while illuminating paths for healthcare advancements on Earth. From life-supporting capsules and dedicated flight nurses to deep-space simulations and AI-assisted diagnoses, the field mirrors humanity's journey from wonderment to purposeful exploration.

Today, carrying adaptive courage and creative medical advancements forward, we seek not only to preserve life in orbit but to enhance its quality, whether tethered to Earth or reaching toward celestial destinations. In the grand saga of human discovery, the next horizon calls us beyond our world—and yet, our most significant challenges may dwell within ourselves. The human body, molded by Earth's gravity and safeguarded by its atmosphere and magnetic shield, now faces an environment for which it was never intended. It is space medicine that serves as both custodian and innovator, committed to maintaining our physiological integrity in the void while turning adversity into progress that illuminates life back on Earth.

To start, microgravity introduces a significant shift from the conditions our bodies have adapted to over millennia. Within days, notable effects become evident. The skeletal system, used to daily mechanical stresses, starts to lose bone mass at a rate not typically seen even in the elderly, with astronauts experiencing losses exceeding one percent monthly in space—far exceeding the usual age-related declines on Earth. At the same time, muscle atrophy manifests, especially in postural and gravitational muscles, leading to reduced strength and endurance. This deterioration results from disrupted protein balance and altered gene activity tied to muscle function. Additionally, as fluids shift upward, they raise intracranial pressure and contribute to vision issues now identified as Spaceflight-Associated Neuro-Ocular Syndrome (SANS).

Microgravity's effects do not stand alone. Cosmic radiation—from energetic galactic cosmic rays (GCRs) and sporadic solar particle events (SPEs)—sneaks past spacecraft shielding, engendering severe risks. Current protective technologies falter against heavy, high-energy particles, leaving body tissues exposed. The potential consequences include DNA damage, cancer risks, neurodegeneration, and alterations in the central nervous system due to impacts on neurogenesis. Intriguingly, the combined pressures of microgravity and radiation may exacerbate

immune dysfunction in ways that remain inadequately understood, highlighting the need for further investigation into their interplay.

Beyond the physical domain, the psychological resilience of astronauts also requires equal scrutiny. Isolation, confinement, disrupted sleep patterns, communication delays, and relentless mission demands create a formidable mental landscape. Research indicates that prolonged missions can provoke symptoms of depression, anxiety, cognitive decline, and shifts in emotional regulation—potentially through neuroplastic changes. While some studies suggest that cognitive abilities may adapt and remain relatively intact, subtler shifts—like slower processing speeds and occasional lapses in attention—are persistent, accompanied by improved emotional recognition. Once astronauts return to Earth, they often confront stress associated with readjustment, insomnia, interpersonal challenges, and shifts in identity as they reintegrate into a constantly evolving world.

The significant insights from the renowned Twins Study provide both caution and understanding. As astronaut Scott Kelly spent nearly a year aboard the ISS while his identical twin remained on Earth, researchers noted unexpected telomere elongation—an unusual stress response—alongside altered gene activity, increased inflammation, cardiovascular strain, and diminished cognitive speed and accuracy. Such findings underscore that even the most elite and prepared individuals remain considerably susceptible to the rigors of space.

In response to these challenges, space medicine is developing innovative countermeasures for musculoskeletal health. Resistive exercise regimens, centrifugation techniques, vibration therapy, and elastic gravity-simulating suits (like the "penguin suit") aim to recreate gravitational effects and reduce the loss of bone and muscle. Concurrently, pharmacological interventions—including bisphosphonates, hormone treatments, and amino acid supplementation—are under evaluation for their potential to preserve bone strength in microgravity.

Nutrition is a vital—though often overlooked—foundation of health preservation. Research in space nutrition highlights how macro- and micronutrients interact with immune function, musculoskeletal health, hormone regulation, and mental wellness. Key factors for mission success include the stability of nutrients over extended periods, the social significance of shared meals, and adjusting dietary needs to mitigate the impacts of radiation and microgravity.

Medication stability presents another challenge. Research indicates that many medications can degrade in spaceflight conditions, potentially becoming ineffective or unsafe during a roundtrip mission to Mars. Scientists are exploring solutions such as on-demand drug synthesis, more durable formulations, and the development of autonomous pharmaceutical manufacturing aboard spacecraft.

At the same time, advancements in radiation protection are underway. New strategies, including ingestible protectants and enhanced shielding materials, are being developed to minimize both cumulative and acute radiation exposure for crew members. These innovations not only benefit astronauts but also have implications for patients on Earth undergoing radiation treatment or working in hazardous environments.

Significant progress is also being made in remote health monitoring and personalized health systems. Space agencies aim to create an autonomous health platform that utilizes continuous biometric data, artificial intelligence, predictive analytics, and tailored decision-making for each crew member. This "Precision Space Health" framework is crucial for deep space missions where medical support from Earth may not be available.

Supporting these advancements, emerging wearable technologies—such as soft exosuits and sensor-equipped clothing—provide dynamic loading, real-time feedback on neuromuscular function, and adaptability for limited spaces. These lightweight systems could revolutionize both

countermeasures in space and rehabilitation for the elderly on Earth.

However, these technological advancements must address ethical considerations. Issues surrounding medical autonomy, the allocation of resources, informed consent in extreme situations, and equitable access to new treatments are fundamental questions in the ethics of space medicine—principles that should guide the design and implementation of health interventions in extraterrestrial contexts.

As we look toward Mars and beyond, the knowledge gained from the International Space Station and analogous settings benefits Earth. The biosensors used for astronauts' vital sign monitoring contribute to telemedicine and remote diagnostics in underserved regions. Radiation-protective substances may eventually shield patients undergoing chemotherapy. Wearable rehabilitation devices designed for space may aid in restoring mobility for frail individuals on Earth. Microgravity-grown organoid cultures can accelerate advancements in disease modeling and regenerative medicine before they even leave the atmosphere.

Yet, a pressing question persists: is investing in space medicine justifiable when urgent health issues exist on our planet? The response emphasizes that space medicine serves as a force multiplier—not a distraction. Every advancement in remote care, biomonitoring, regenerative sciences, and bioengineering ultimately enhances life back on Earth. Few sectors demonstrate how necessity drives innovation more than in the pursuit of health in the absence of gravity.

As we gear up for exploration of the Moon, Mars, and beyond, space medicine acts as both shield and guide. It transforms the challenges of weightlessness into new perspectives on medicine, physiology, and our understanding of biological endurance. When we develop new supports for bones, ensure pharmaceuticals can withstand the void, and maintain cognitive stability under isolation, the benefits extend far beyond spacecraft and reach into every clinic, caring for remote patients and vulnerable populations here on Earth.

Ultimately, space medicine challenges us to do more than survive the void; it urges us to redefine health. Each mission to the stars becomes a journey of exploration—not just into space, but into the depths of our biology, creativity, and healing capacity, whether in orbit or at home. Regardless of gravity's pull, the lessons from our extraterrestrial endeavors persist, as impactful and transformative as the stars themselves.

Short Communication

The Need for a Global Registry of Descriptive Anatomical Studies on Rare Variants to Mitigate Publication Bias

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Meta-analyses of prevalence studies in anatomy are increasingly being used to draw conclusions regarding the frequency of rare anatomical variants. However, a major and largely underrecognized threat to the validity of these efforts lies in publication bias due to selective reporting. As demonstrated in a recent study, this bias may not only distort individual findings but may systematically inflate the pooled prevalence estimates of such variants—particularly when studies are retrospective, small, or lack pre-registration [1].

In the current scientific ecosystem, descriptive observational studies in anatomy are rarely pre-registered. Negative results—i.e., the absence of a particular anatomical variation—are seldom published, while positive findings, even from studies with minuscule sample sizes, are likely to be disseminated. This leads to a pernicious asymmetry: rare variants are more frequently "discovered" than disproven, resulting in inflated prevalence estimates, as the absence of evidence is not systematically recorded [2].

Papadopoulos et al. illustrate how this process mimics the phenomenon of HARKing (Hypothesizing After Results are Known), wherein the discovery of a rare variant in a small cohort retrospectively justifies the publication of prevalence data. This practice, when compounded across multiple such studies, propagates a cumulative publication bias in meta-analytic estimates—particularly acute in studies dealing with anatomical features that occur with a prevalence <1%.

Using both empirical data and simulations, the study quantifies the maximum publication bias (b(obs)) due to selective reporting. The theoretical bias in some studies reaches up to 50% when a single case is reported in a small cohort, a situation surprisingly common in anatomical research. For instance, in the analysis of dorsal wall agenesis of the sacral canal and arc of Bühler, adjustment for selective reporting reduced the pooled prevalence from 0.017 to 0.013 and from 0.015 to 0.013, respectively [3, 4]. In the case of azygos lobe, which involved much larger samples, the observed and adjusted values remained largely similar—highlighting how sample size mitigates bias [5].

Notably, conventional tools for assessing publication bias—Egger's and Begg's tests, funnel plots, trim-and-fill analysis—proved insufficient to detect or correct for such bias reliably. Only the Doi plot and the LFK index showed consistent performance in identifying and quantifying asymmetry, particularly when comparing data before and after adjustment for reporting bias.

To safeguard the integrity of future meta-analyses in anatomy, we advocate for the establishment of an international registry for descriptive anatomical studies—a platform analogous to e.g. ClinicalTrials.gov, but dedicated to observational anatomical research. This registry would require prospective registration of study protocols, especially for investigations of rare variants. Its major contribution would be to promote transparent reporting, including the publication of null results, to serve as a valuable source for unbiased meta-analytic inclusion, and to enhance methodological rigor and reproducibility in anatomical science.

Such a registry could be initiated under the

auspices of academic and professional societies, particularly within the framework of international congresses on clinical and surgical anatomy. We envision it as a collaborative effort between anatomists, statisticians, journal editors, and database curators, modeled after established registries in clinical research.

The time has come to bring descriptive anatomical research into the era of scientific accountability and transparency. Without the implementation of systematic pre-registration, the discipline remains vulnerable to structural distortions in evidence synthesis. The creation of a global registry is not only feasible—it is essential.

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Historical Vignette

Possessed by Rhythm: The Mystery of the Medieval Dancing Plagues

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Introduction

Dancing Plague, choreomania, dancing mania, St. Vitus' dance, and tarantism are some of the many names used to describe the sudden outbreaks of dancing sprees reported in the Middle Ages. Between the 11th and the 16th century, several instances of Dancing Plagues were recorded in Central Europe, especially in areas along the Rhine and Moselle Rivers. The earliest recorded report involves 18 people who spiraled into a dancing mania on Christmas Eve of 1028 outside a church in the German city of Kölbigk. Other later instances include 1247 Erfurt, Germany, and 1278 Utrecht, when the dancing mania of 200 people led to the collapse of a bridge and their eventual death in the waters of the Moselle River. The most well-reported and certain cases of Dancing Plagues happened in western Europe of 1374, and in the city of Strasbourg in 1518 (1, 2).

St. John's dance, 1374. In 1374, during the celebrations of St. John's festival in Aachen, several people formed circles and began dancing uncontrollably for hours until collapsing from exhaustion. The dancing spree gradually spread to neighboring cities of Liege, Maastricht, Ghent, Utrecht, Metz, Trier, and Strasbourg, affecting all people regardless of age and sex. During their dancing mania, people were said to have lost control of their senses, being unaware of their surroundings and haunted by visions and strange emotional states. After collapsing, people complained of pressure and pain, symptoms that were relieved by tightly wrapping them with cloths. Seizures, dyspnea, and depression often preceded the dancing mania. Beak-like shaped masks and red-colored clothes sometimes seemed to trigger or provoke the dancers, even leading to their prohibition in Liege. It took 4 years for the dancing epidemic to finally cease (1, 2, 3, 4).

The Dancing Plague of 1518. The dancing epidemic that hit Strassburg in July of 1518 is very well detailed. It all started with a woman who fell into a dancing mania lasting 4 to 6 days continuously. Within a week, the victims of the dancing spree were 35, a number that surged to over 400 by late August. The symptoms were similar to those found in earlier occasions of dancing mania – involuntary, uncontrollable dancing, accompanied by pain and begging for mercy, that eventually led to exhaustion and sometimes, in people prone to strokes or heart disease, death. Physical contact wasn't necessary for the disease to spread, as just the vision or the sound of the frenzy could inspire more people to follow.

In an attempt to confine the Dancing Plague, authorities constructed a wooden stage and emptied two guildhalls and the outdoor grain market. They thought more dancing was enough to deal with the dancing mania. To this point, they even hired musicians and professional dancers to enhance their dance and keep the affected in a constant day and night movement until their minds and blood were finally free. However, when the first deaths made their appearance among the dancers, the authorities were forced to change strategy. Now, the plague was considered a curse from St. Vitus. Gambling, prostitution, and gaming were banned in order to please the Saint. Furthermore, the dancers were transferred to a church in the Vosges Mountains, where they were given red shoes and guided to a ritual dance around a wooden

carving depicting St. Vitus, Virgin Mary, and Pope Marcellus, as an act of repentance and prayer for divine help. As the chroniclers notice, most dancers stopped dancing and regained control of their bodies (3 , 4, 5).

Imanenjana, Madagascar. In February of 1863, a strange dancing plague broke out in the southwest part of Madagascar. Until March, it had reached the capital and the surrounding areas, affecting hundreds of people. Locals called the disease Imanenjana and the dancers Ramanenjana. Just like the previously described choreomania epidemics, victims were subjected to involuntary dancing movements that lasted for hours until exhaustion or even death from heart failure. During the episode, the dancer appeared to be in an euphoric state of mind, having no control over their senses. Other symptoms included pain, convulsions and seizure-like episodes. As reported by many Western observers, the disease seemed to be highly contagious. In particular, just the sight of a dancer was enough for the people around them to enter the dancing frenzy, often in a way resembling some religious or ritualistic act. The disease seemed to affect mainly people of the lower socioeconomic classes of native Madagascarians. At the time, King Radama II came into power, permitting religious freedom and reopening Madagascar to European influence, in contrast to the strict independence policy of his predecessor. As a result, locals were in a general distress and dissatisfaction, feeling and being threatened by the arbitrariness of the Europeans. Interestingly, no Christians were affected by choreomania, perhaps since the changes were in favor of them or because of their general belief that the dancing mania was a result of demonic possession of the pagan locals. Many of the victims describe a hatred against swine, hats, and black colored clothing, spiking their rage during those episodes. This may reflect symbolic associations. Hats and black clothing possibly representing European authority, while swine were traditionally viewed as unclean in local beliefs, thus triggering that rage (1)

Etiology. Demonic possession_ The earliest guesses regarding the etiology of Dancing Plagues involved demonic possession. In a time marked by profound religious devotion and limited medical knowledge, any strange incident was attributed to the Devil and his demons. Therefore, the spontaneous dancing sprees affecting the population couldn't be an exception. In particular, those possessions were considered a result of invalid baptisms performed by a corrupt clergy. Baptism itself was even regarded as a way of prevention (5).

Tarantism_ Spider bites were considered the etiology in the cases of choreomania occurring in the southern Italian region of Apulia. In the 15th to 17th centuries, several cases of tarantism – the name used in Apulia for choreomania – occurred. At the time, a spike in the number of large spiders was reported because of deforestation and a dry climate. In many cases, a spider bite preceding the dancing mania was reported by the victims. It is possible that spider venom or an unknown pathogen carried by spiders could have induced the disease. However, a spider bite could not be found in the history of all tarantism victims, and no experiment trying to reproduce the spider bite's results bore fruit. It seems more possible that spider bites worked as a trigger of a violent disorder leading to choreomania – a result of the fear and certainty of citizens that, after getting bitten, they will suffer from tarantism. Besides, spider bites were never associated with a Dancing Plague in any of the other cases of Dancing Plague occurring in Central Europe (5, 6, 7, 8).

Ergot poisoning_ Another theory proposed about the etiology of the Dancing Plague was ergot poisoning. Ergot poisoning occurs when rye contaminated with the fungus Claviceps purpura is consumed. Rye was a widespread cultivated crop, very important for the diet of poor citizens in the Middle Ages – the ones mainly affected by the Dancing Plagues. There have been several ergot-induced epidemics throughout history, leading to hallucinations, convulsions, nausea, and itching, often followed by epileptic seizures. Those symptoms seem to fit well with the ones experienced by the Dancing Plague victims. However, gangrene of the limbs, one of the main characteristics of ergotism, was absent in all cases of choreomania. Therefore, dancing

epidemics can't be safely attributed to ergotism epidemics. Furthermore, despite rye being one of the main ingredients in the diet of Central Europeans, it was never really cultivated by Italian farmers to any great extent. As a result, ergot couldn't be the reason behind tarantism (5, 6).

Year	Location	Approx. Number Affected	Key Symptoms	Proposed Etiologies
1028	Kölbigk, Germany	18	Involuntary dancing near a church	Demonic possession, religious beliefs
1247	Erfurt, Germany	Unknown	Uncontrolled dancing, exhaustion	Social stress, mass hysteria
1278	Utrecht, Netherlands	200	Dancing leading to bridge collapse and deaths	Mass psychogenic disorder, stress
1374	Aachen, Germany & neighboring cities	Hundreds	Uncontrollable dancing, loss of senses, pain, dyspnea, depression	Religious festival context (St. John's Day), mass hysteria, social hardship
1518	Strasbourg, France	35 → >400	Continuous dancing for days, exhaustion, sometimes death; begging for mercy	Psychological distress, St. Vitus curse, mass hysteria
15th–17th c.	Apulia, Italy (Tarantism)	Unknown	Involuntary dancing after spider bite, convulsions	Tarantism (spider bite), social belief, psychogenic factors
1863	Imanenjana, Madagascar	Hundreds	Euphoric trance-like dancing, exhaustion, convulsions, rage against certain symbols	Social upheaval, colonial pressures, psychogenic contagion

Table 1: Comparison of proposed etiologies and symptoms for each major outbreak

Curses of Saints_ In the profound religious times of the Middle Ages, plagues were often associated with the wrath of Saints. Saint Vitus, the protector of epileptic patients, was considered responsible for the sporadic outbreaks of choreomania, also called ''St Vitus ' Dance''. This belief arose from the outbreak of two such small epidemics during the celebrations of St. Vitus Day in the 15th century. Some commonly used curses of the time include 'God give you St. Vitus' and 'May St. Vitus come to you', which were believed to condemn the cursed person into a dancing mania. The victims of the 1518 choreomania were eventually brought to a chapel and danced around a painting of St. Vitus as the final treatment option. The Dancing Plague of 1374 also broke out during St. John's Day festivities, attributing the dancing sprees to St. John or the Devil himself. It is likely, that the blind faith and the collective fear of devine wrath among the uneducated, religious population led to St. Vitus dance outbreaks - triggered by some psychologically fragile individuals, persuaded they were suffering from a malediction, spiraling into dancing sprees, and gradually dragging a large part of society into their hysteria (5, 6, 9).

Hard times_ Without doubt, the Middle Ages were times of great social adversity. Hunger, deadly plagues, violent crimes, poverty, segregation, unsanitary conditions, and hardship were everyday life problems for the poor citizens of Central Europe. Some years before the 1374 dance epidemic, the Black Death, one of the

most fatal pandemics of human history, tormented Europe, decimating the European population by a quarter. Between the late 15th and early 16th century, Strasbourg was afflicted by successive famines, extreme weather, and economic hardship. Destruction of crops by natural causes was followed by rising taxation and the removal of traditional peasant rights, further pauperizing the poor. By 1516–1517, there was famine, starvation, and mass mortality caused by food shortages and harsh winters, while social tension, failed rebellions, and widespread resentment against the Church and ruling elites plagued the population. Syphilis, smallpox, and bubonic plague epidemics terrorized the citizens. All the above were seen by many as manifestations of divine vengeance. Amid this climate of suffering, fear, and disillusionment, psychological distress deepened, creating fertile ground for mass hysteria and trance-like states, such as the dancing mania of 1518 (6, 9).

Treatment. As Dancing Plagues kept appearing in Medieval Europe, authorities were in a constant search for treatment options. During the 14th and 15th centuries, physicians were not involved with the cure of dancing manias. Priests and magistrates were responsible for dealing with the dancing epidemics, often engaging in exorcisms and other mystical actions. In the 16th century, Paracelsus acknowledged the psychiatric factor behind choreomania, and proposed different therapies depending on the origin of each outbreak. Outbreaks resulting from 'careless spirits and impaired willpower' were treated with rest and isolation, whereas outbreaks originating from natural disorders were treated with pharmacological treatments with agents such as opium, drinkable gold, and ethanol. On the other hand, witchcraft was used for cases when St. Vitus Dance was a result of the dancers' imagination. In particular, wax effigies of the afflicted were crafted, into which, through intense concentration, the patients transferred their thoughts and passions, before casting them into the fire as an act of self-purification. Music, more dancing, and other rituals were also proposed as treatment options during those ages of despair. Music was considered the sole cure for the outbreak of tarantism that occurred in southern Italy in the 17th century (5, 9, 10, 11).

Conclusion

The power of the human brain is magnificent. The psychosomatic symptoms caused by a distressed mental state are common among 21st-century humans. Mental health experts have become very popular in treating headaches, fatigue, dizziness, diarrhea, and other physical issues associated with the stressful everyday routine. It is to be expected that, in the Middle Ages, a time when uncertainty and insecurity were much greater than the ones people experience today, the psychosomatic symptoms experienced by citizens would be much more intense. The Dancing Plagues are considered to be an early example of mass psychogenic illness, a phenomenon where psychological distress manifests as physical symptoms among groups, often fueled by shared anxieties, cultural context, and a lack of alternative explanations. Furthermore, mirror neurons may also play an important role. These specialized brain cells are believed to facilitate imitation and empathy, possibly explaining how the sight of a dancer could subconsciously trigger similar movements in observers, propagating the mania.

Therefore, choreomania as a result of extreme insecurity, fear, and mass hysteria is possibly the best explanation behind the Dancing Manias that plagued Medieval Europe. The human brain, a so powerful organ that it can trick itself into feeling sick and even unstoppably dancing to death, has a lot of well-kept secrets yet to be discovered. However, caution must be exercised as assigning psychiatric labels to historical events involves the risk of retrospective diagnosis, which may impose modern clinical interpretations onto culturally and contextually distinct phenomena.

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Prospective Study

The use of tranexamic acid in hip fracture surgery. A prospective study in a Major Trauma Centre

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The perioperative rate of blood transfusion in patients undergoing hip fracture surgery remains high. The use of tranexamic acid in hip surgery is found to decrease blood loss and transfusion rates.

A prospective study was conducted from November 2018 to January 2022 and included patients with hip fractures that underwent hip surgery in a Major Trauma Centre. A tranexamic acid(TXA) administration control protocol was established, and patients were randomly assigned in two groups with equal number of patients: Group A included those who received TXA and Group B was the control group. Patient's demographics, fracture type, blood transfusion demands during operation and post operatively, thromboembolic events, mean operative time, and mortality rates were recorded for each group.

Both groups included 50 patients. In Group A, 8% of patients needed transfusion with 1 unit of condensed red blood cells, while in group B 50% of patients needed transfusion. Blood loss was higher postoperatively in Group B.

The use of TXA in hip fracture surgery in Major Trauma Centers is effective, as it decreases transfusion demands and is a safe option without affecting the incidence of thrombotic events and mortality rates.

Keywords: tranexamic acid, hip fracture, Major Trauma Centre, hip surgery, blood loss

Introduction

Hip fractures in the elderly remain a serious public health factor around the globe, as they are associated with high morbidity rates and high mortality rates that reach up to 30% within the first-year post-injury(1, 2). These types of fractures require immediate surgical treatment, however past medical history, hidden blood loss due to the fracture and need for massive blood transfusions need to be taken into consideration(3, 4). Studies show that bleeding following a hip fracture and subsequent surgery may also contribute to postoperative morbidity and mortality(1, 5).Geriatric patients that already receive anticoagulants are at a further risk of an even higher blood loss.Postoperative anaemia can trigger cardiac or renal symptoms especially in patients suffering from cardiac preconditions or renal dysfunction(2).

It is observed that the need for blood transfusion during or after hip fracture procedure fluctuates from 20% to 60% (1, 3, 6). Allogenic blood transfusion is an important tool to correct anaemia, however, is associated with adverse effects, such as infectious diseases, haemolytic reaction, cardiovascular dysfunction, postoperative infection and is also found to increase hospital length of stay(2, 3).

Recent retrospective studies and meta-analyses indicate that the use of tranexamic acid in hip surgery significantly decreases blood loss and transfusion rates(1, 7-10). Tranexamic acid is a synthetic analog of the amino acid lysine. It serves as an antifibrinolytic by reversibly binding four to five lysine receptor sites on plasminogen. This decreases the conversion of plasminogen to

plasmin, preventing fibrin degradation and preserving the framework of fibrin's matrix structure(6, 11, 12).Tranexamic acid has roughly eight times the antifibrinolytic activity of an older analogue, ε-aminocaproic acid. It also directly inhibits the activity of plasmin with weak potency, and it can block the active site of urokinase plasminogen activator (uPA) with high specificity, one of the highest among all the serine proteases(6, 11, 12).

The purpose of this study is to present the effectiveness of the administration of tranexamic acid (TXA) (transamin) to patients suffering from hip fractures in a Major Trauma Centre evaluating the need for blood transfusions during their hospitalization and complication rates.

Materials and Methods

A prospective study was conducted from November 2023 to April 2025 and included patients with hip fractures that underwent hip surgery in a Major Trauma Centre.

A tranexamic acid administration control protocol was established for patients with hip fractures. Inclusion criteria included:intertrochanteric fractures and femoral neck fractures based on AO-OTA classification and Garden classification respectively, Hb preoperatively (Measurement of hemoglobin before the patient is admitted to the operating room), Hb postoperatively on the first and the third day, number of condensed red blood cells (pRBC), total blood loss preoperatively and postoperatively, thrombophlebitis, pulmonary embolism and first trimester mortality.

Exclusion criteria were presence of liver failure, renal failure, active coronary artery disease, presence of coronary stents as these patients already receive antiplatelet treatment and cannot be operated on immediately after admission, history of hemorrhagic stroke in the last year, anticoagulant treatment, coagulation disorders, platelets < 50.000, surgery after the fifth day of admission to hospital.

Patients with hip fractures included in the study were randomly assigned in two separate groups as follows: 1) Group A included patients who were administered 1gr. tranexamicacid iv intraoperatively during skin incision and 1gr. tranexamic acid iv during wound closure 2) Group B included equal number of patients who were administered 1gr. Saline iv intraoperatively during skin incision and wound closure respectively.

Data regarding demographics of the patients, fracture type, blood transfusion demands during operation and post operatively, thromboembolic events, mean operative time, and mortality rates were recorded for each group separately.

All data were extracted using a Microsoft Excel spreadsheet. The study was not registered on Clinicaltrials.gov. The protocol for this study was approved by the Hospital Ethics Committee and all patients provided written informed consent.

Results

From the above-mentioned criteria, 100 patients with hip fractures were finally included in the study. Both groups included 50 patients. Regarding patient's demographics, in group A, 66% (33/50) were females and 34% (17/50) were males. In group B, 58% (29/50) were females and 42% (21/50) were males. Mean age was 84 years (range, 75-94) in group A and 83 years (range, 72-89) in group B.

Fracture types in both groups are presented in table 1.

In Group A, 4 out of 50 patients (8%) needed to be transfused with 1 unit of condensed red blood cells,even though they were administered tranexamic acid (Table 2).No pulmonary embolism or thromboembolic event was observed. Mortality rates were 0 during the first trimester. Blood loss was of the order of 1-2 vials of RBC between the first and the third postoperative day.

Groups	Gender (number of patients)		Type of fracture (number of patients)	
	Male	Female	Intertrochanteric	Femoral neck
A	N/A	33	20	13
A	17	N/A	10	7
B	N/A	29	20	9
B	21	N/A	12	9

Table 1. Patient's demographics and fracture types

In Group B, 50% (25/50) of patients required transfusion with a unit of condensed red blood cells during the operative procedure (Table 2). Six percent (3/50) of patients developed pulmonary embolism. One patient died during the first trimester. Blood loss was of the order of 3-4 vials of RBC between the first and the third postoperative day.

Mean operative time was the same in both groups: 62 min.

Discussion

In this prospective study on TXA use in hipfracture surgery in a Major Trauma Centre, the authorsfound that the number of patients who required blood transfusion were significantly lower in Group A (TXA Group) compared to Group B.This is in accordance with the published literature, where TXA usage is found to beassociated with a17% decrease in blood transfusions(6, 13).Interestingly, in a case-control cohort study which was conducted among 271 patients undertaking hip hemiarthroplasty for intracapsular hip , the authors noted that a single preoperative dose of TXA reduced the chance of blood loss requirements by three times(14). This is also proper to findings from previous case series, which have shown a positive effect of TXA dosage on minimizing surgical blood loss and blood transfusions(14-16). This finding is highly important for public health systems, as allogeneic blood transfusion has been associated with longer hospital stays and higher costs , estimated at 1731$ per hospital admission and is also related to several complications mentioned above, while a single dose of tranexamic acid costs 5$ and has fewer reported complications(13, 17).

Interestingly, in Group A none of the patients developed DVT or PE. In another randomized controlled trial of 72 patients, Tengberg et al.(18)found that TXA reduced total blood loss by600 mL and reduced the risk of blood transfusion, without a notable increase in venousthromboembolic events at 90 days post surgically(18).These results have been found to be associated with another randomized clinicaltrial of 100 participants with intertrochanteric femur fractures who received2 doses of IV TXA – 1 dose given prior to surgery and 1 dose 3 h following surgery.The relative risk of blood transfusion was 0.5 within the TXA group and no thrombotic events were reported(19). However, recent meta- analysis shows that, there was no significant increase in VTE risk between patients in TXA groups and non TXA groups(6, 8, 20, 21).

It is worthy of mention that patients presented in this study had various types of hip fractures both intracapsular and extracapsularthat require different types of surgical interventions.The majority of fractures,however,in this study were extracapsular. In general, extracapsular hip fractures are connected with massive blood loss compared tointracapsularones. Taking that into consideration, the effect of TXA may range in different types of hip fractures, and thus in various surgical methods.

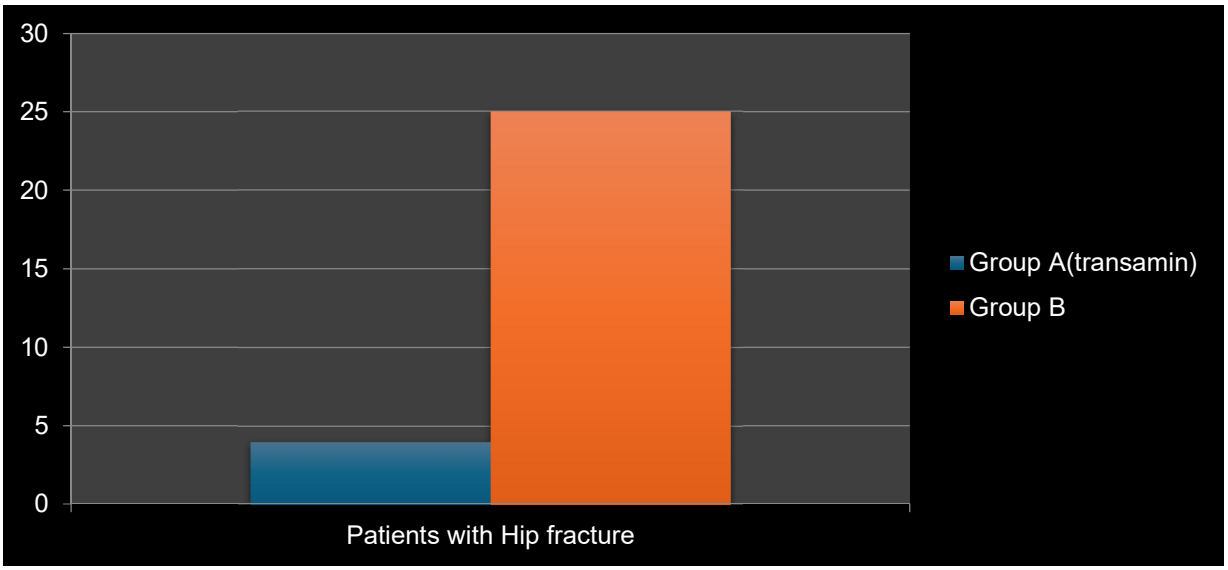

Table 2. Number of patients that required blood transfusion in both groups

The most common surgical treatment for extracapsular hip fractures is the use of an intramedullary nail. Intracapsular hip fractures are managed differently based on the extent of the fracture displacement(12). Percutaneous Pinning is an invasive surgical technique used to treat certain types of fractures including valgus impacted and non-displaced femoral neck fractures in younger patients, whereas displaced femoral neck fractures in older patients are often treated with hip hemiarthroplasty or total hip arthroplasty(12).

In this study complications and mortality rates did not differ significantly between the two groups. These findings are consistent with the literature, where thrombotic events, infections, ischemia, and mortality rates had no statistically significant differences between TXA groups and comparator groups(1, 20, 22, 23).

The ideal regional dosing of TXA to maximize efficacy whileminimizing the risks of potential side effects remains an active area of research. In this study, patients were administered one dose of TXA iv during skin incision and one during skin closure. Published studieshave been inconsistent regarding dosing regimens. Variousdosing regimens for TXA have been studied to establish the best results. Some protocols suggest a single dose before surgery, a preoperative dose followedby a second dose 3 hours later, while others recommend a preoperative dose followed by continuousintraoperative infusion, or a preoperative dose followed by a24-hour continuous infusion postoperatively. However, future studies should prioritize head-to-head comparisons of dosing strategies of TXA inhip fracture patients(6).

The optimal route of administration of TXA remains uncertain.In most studiespublished in the literature TXA is administered intravenously. TopicalTXA has also gained attention in recent medical literature. However, the available data on its long-term safety and efficiency of topical TXA compared to IV TXA are somewhat limited in hip fracture patients(6, 13). Emara et al. in a randomized control trial presented that both topical and IVTXA are equally effective at reducing bleeding and the need for blood transfusion however, IV TXAadministration was linked to a 30% increased risk of VTE events compared to topical TXA. Therefore, the authors of that study concludedthat theuse of topical TXA may be a safer choice compared to IV TXA(15).

Limitations

This study has several limitations. First, this is not a randomized controlled trial and there is not strong statistical evidence regarding the results presented. In addition, there is not a long term follow up period, as patients' data were recorded up to the first trimester. The sample of the patients included in this study was relatively low compared to other studies.

Conclusion

In conclusion, the use of TXA in hip fracture surgery in Major Trauma Centers is highly effective, as it decreases transfusion demands and is a safe option without affecting the incidence of thrombotic events and mortality rates. Our results are consistent with other recently published studies in the literature, however more studies are needed to further assess the optimum route, dosage, and efficacy of TXA in patients with hip fractures.

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Review

Circumportal pancreas: A review of the literature

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Circumportal pancreas is an uncommon congenital defect where pancreatic tissue fully surrounds the portal vein and/or the superior mesenteric vein. Typically, it is discovered incidentally during imaging studies or during regional surgeries conducted for different issues. It can sometimes be overlooked, leading to intra- and postoperative complications, such as pancreatic fistulas, infections, and hemorrhage.

This study aims to increase awareness of this rare anatomical variation to avert serious repercussions during pancreatic procedures. Thorough research was performed using the PubMed database with the search terms: "circumportal" and "pancreas".

It is crucial to recognize circumportal pancreas before surgery to understand ductal anatomy and avoid potentially life-threatening complications. MRI and CT scans are essential for detecting this condition along with any related vascular abnormalities.

Keywords: "Circumportal", "Pancreas"

Introduction

Circumportal pancreas (CirP) is a rare and often overlooked congenital pancreatic anomaly. In this condition, pancreatic tissue completely surrounds the portal vein (PV) and/or the superior mesenteric vein (SMV). Literature suggests that the prevalence of this abnormality varies between 1.14% and 2.5%, highlighting its rarity (1,2). There is no evidence of sexual predominance for this anomaly, and it is considered less common than other pancreatic variations like annular pancreas or pancreas divisum (3). Various terms exist to describe the same condition, including retroportal pancreas, portal annular pancreas, and complete encasement of the portal vein by pancreatic tissue (4). The first documented case of CirP appeared in 1987 by Sagiura et al., who inadvertently identified a circumportal pancreas encompassing the superior mesenteric vein during pancreatic surgery. Since that time, numerous publications have emerged, predominantly chronicling individual case reports (1).

Typically, CirP is asymptomatic and is frequently discovered incidentally during pancreatic surgery or imaging conducted for unrelated issues (5). This report aims to raise awareness of this anatomical variation to prevent serious intra-operative and post-operative complications, such as infection, hemorrhage, and pancreatic fistula.

Materials and Methods

A comprehensive investigation was performed using the published literature obtained from PubMed with the keywords: "circumported" and "pancreas." Data extraction was carried out through a standardized data collection form based on the specified keywords. The research adhered to the PRISMA 2020 flow diagram for new systematic reviews, which included searches of various databases, registers, and other relevant resources. Pertaining to PRISMA guidelines, the initial records identified through the PubMed search amounted to 36. All 36 full-text articles were evaluated for eligibility, with 10 records excluded due to non-relevant titles and abstracts. Ultimately, none of the articles assessed for eligibility were excluded, and no additional filters were applied. In conclusion, 26 references that met the specified criteria were

utilized in this study.

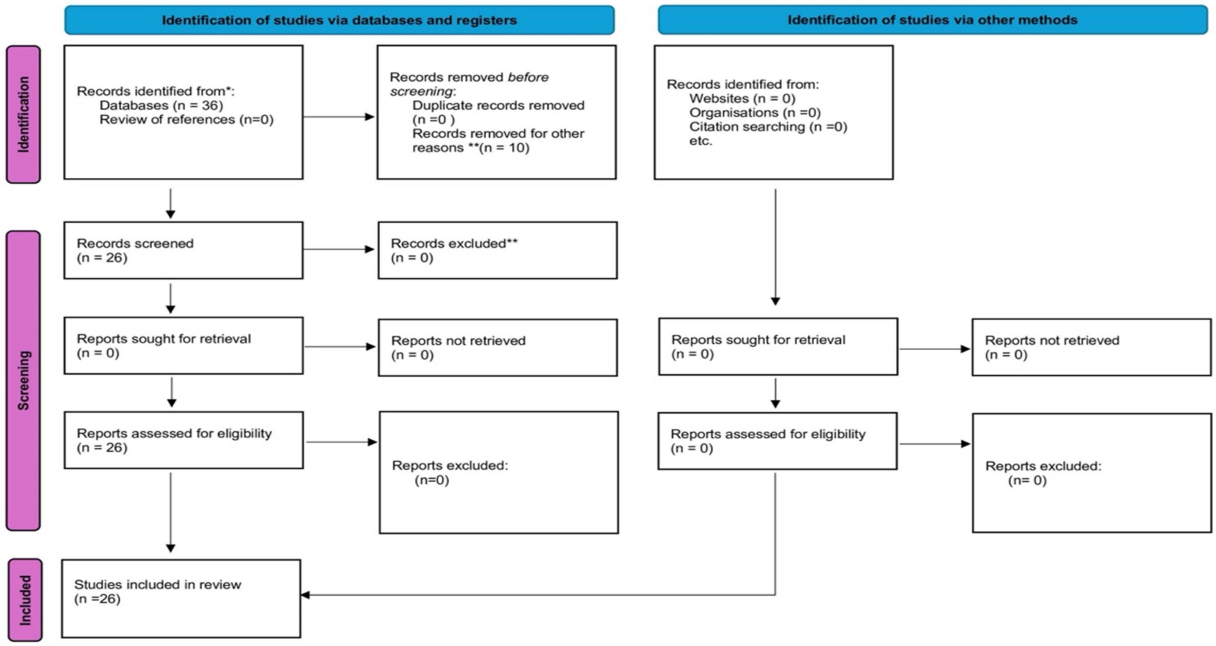

Figure 1. PRISMA 2020 flow diagram for new systematic reviews

Results

The vast majority of the studies demonstrated that there is no difference between sexes in the prevalence of circumported pancreas. Moreover, no background or environmental factors were not reported in the development of this rare abnormality. There are no data indicating reasons causing this embryological abnormal fusion. Finally, there are no symptoms in most of the cases and the discovering of this variance is incidentally in investigation of the area for other reasons.

Discussion

The typical pancreas originates from two separate anlagen within the embryonic foregut, specifically an endodermal tube that develops into a ventral and dorsal pancreatic bud during the fourth week of embryonic development (6). The larger dorsal bud gives rise to the dorsal pancreas (body and tail) as well as the anterior part of the pancreatic head, while the ventral pancreatic bud forms both the uncinate process and the posterior segment of the pancreatic head, collectively making up the ventral pancreas (7). The uncinate process, anteromedial in position and located behind the portal vein and/or the superior mesenteric vein, typically does not merge with the pancreatic body.

Each component drains secretions into the foregut via their respective ducts, namely the ventral and dorsal ducts. The ventral and dorsal buds arise on opposite sides of the foregut. It has been estimated that during the seventh week of gestation, the ventral bud rotates counterclockwise toward the dorsal pancreatic bud to fuse. However, recent work by Kin et al (5) suggests that the significant growth on the left side of the primitive duodenum promotes the passive relocation of the ventral pancreas

posterior to the duodenum and its eventual fusion with the dorsal bud. Thus, the formation of the mature gland occurs through the merging of both the ductal systems and parenchyma of the ventral and dorsal buds around the seventh week of fetogenesis (8). In the developed pancreas, the ventral duct serves as the primary channel for drainage into the major duodenal papilla, while the dorsal duct either fully involutes at the minor papilla (in 30% of cases) or partially involutes, contributing some drainage to the minor papilla (in 60% of individuals).

This intricate and differential movement and fusion of pancreatic buds pre-dispose the gland to various anomalies, including pancreas divisum, annular pancreas, and circumportal pancreas (9). Unlike the typical annular pancreas, in which the pancreatic parenchyma surrounds the descending duodenum, circumportal or portal annular pancreas represents a variant where the uncinate process encircles the portal vein and/or the superior mesenteric vein (10). Therefore, it is suggested that an aberrant fusion of the ventral and dorsal buds (occurring cranially to and left of the portal/superior mesenteric vein) results in a ring of pancreatic tissue encircling these vessels.

Joseph et al categorize circumportal pancreas into three types based on the primary pancreatic duct's (MPD) pathway. Type I features the ventral pancreatic bud merged with the body of the pancreas, associated with a retroportal MPD. Type II includes the same characteristics as Type I but presents with pancreas divisum. Finally, Type III describes an encasing uncinate process with an anterolateral MPD route (11,12). Furthermore, Karasaki et al propose subdivisions based on the fusion relationship between the uncinate process and pancreatic body in relation to the splenic vein: Type A (suprasplenic), Type B (infrasplenic), and Type C (mixed). Type IIIa is the most frequently encountered subtype (44.4-82%) followed by Type Ia (5-27.8%) (13). However, these classifications do not encompass all reported variations of circumportal pancreas to date (14).

Circumportal pancreas typically does not exhibit distinct clinical symptoms. Most cases are incidentally identified during imaging conducted for other reasons or surgical processes (15). It may be misinterpreted as a mass in the pancreatic head, a tumoral mass surrounding the portal vein, or a mass situated posterior to it (16). Notably, 52.9% of intraoperatively identified circumportal pancreas cases were overlooked in preoperative imaging (17). MRI is considered superior to CT as it can visualize the accessory pancreatic duct, making it preferable for patients needing pancreatic surgery. A CT scan or MRI is generally adequate for diagnosing circumportal pancreas, requiring the imaging of the uncinate process adjacent to the pancreatic body across two or more contiguous sections. While contrast-enhanced CT offers a clearer assessment, it is not strictly necessary (18). Additionally, a retroportal MPD path is better delineated through contrast-enhanced CT imaging (including arterial and portal phases) (19). In MRI, fat-suppressed T2-weighted and contrast-enhanced fat-suppressed T1-weighted images effectively outline circumportal pancreas and the retroportal main pancreatic duct. Employing multiplanar reformats derived from thin CT slices is essential for improved depiction accuracy of the anomaly, while careful consideration must be given to avoid confusing peripancreatic lymphadenopathy or a distended caudate lobe of the liver with circumportal pancreas.

Moreover, arterial phase CT may assist in assessing hepatic artery anatomy, as Ishigami et al noted that 25% of individuals with circumportal pancreas displayed atypical arterial anatomy, including a replaced right hepatic artery (from the superior mesenteric artery), a replaced left hepatic artery (from the left gastric artery), and an abnormal course of the common hepatic artery traversing pancreatic tissue.

Circumportal pancreas cases often present with accompanying vascular variations, such as unusual extensions of the celiac artery or common/right hepatic artery. These variations can considerably influence intraoperative outcomes and lead to multiple complications. Common variations include the transition of common hepatic artery through pancreatic

parenchyma and the right hepatic artery's replacement by the superior mesenteric artery (SMA)(19).

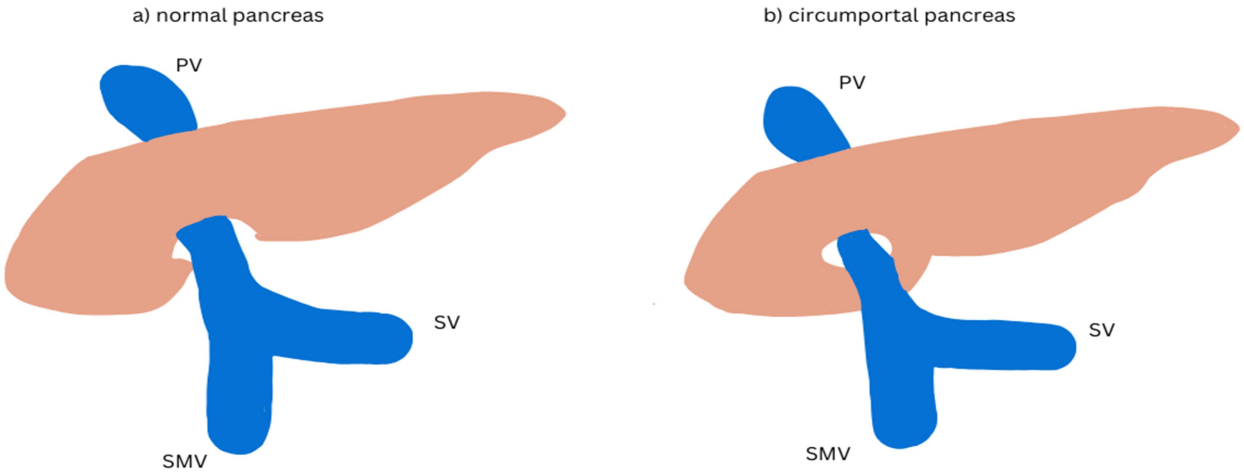

Figure 1. Schematic illustration depicting a) normal pancreas b) circumportal pancreas and portal vein (PV) splenic vein (SV) and superior mesenteric vein (SMV)

Inadequate preoperative detection of this abnormality may significantly impact surgical procedures (20). The retroportal course of pancreatic tissue necessitates additional resection posterior to the portal vein (PV) or superior mesenteric vein (SMV) during pancreatic head resections, expanding the resection area (21,22). Consequently, pancreatojejunal reconstruction becomes complex, requiring a partial dorsal placement relative to the PV or SMV (23). This added complexity notably amplifies the risk of postoperative pancreatic fistula occurrence, with a reported incidence of 46.7%. Additionally, anatomical variations of the common or right hepatic artery can complicate surgical preparation, particularly in instances of suprasplenic vein involvement with atypical arterial pathways arising from the celiac trunk. The most challenging type of circumportal pancreas may be the mixed type, where both suprasplenic and infrasplenic vessel encasing necessitates three divisions (24).

In summary, it is crucial for surgeons to recognize circumportal pancreas, as it may elevate the risk of pancreatic leakage, particularly when accompanied by a retroportal main pancreatic duct (25).

Conclusion

It is extremely important for pancreatic surgeons to thoroughly examine and identify CirP in preoperative imaging to understand the ductal anatomy and connections (26). Diagnosing this condition can be difficult, yet it is essential to prevent intra- and postoperative risks that could endanger patients' lives. An accurate preoperative diagnostic assessment includes contrast-enhanced CT scans and MRI (T1-weighted and T2-weighted) imaging. Because CirP can be challenging to detect via imaging, vascular variants like a right hepatic artery originating from the SMA may provide helpful clues regarding the presence of CirP.

Abbreviations

CirP: Circumported Pancreas, PV: Portal Vein, SMV: Superior Mesenteric Vein, SMA: Superior Mesenteric Artery, CT: Computed Tomography, MRI: Magnetic Resonance Imaging

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Case Report

Charcot Foot Arthropathy: A case study on how non-compliance to conservative therapy recommendations leads to below knee amputation

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Abstract

Charcot arthropathy is one of the most severe complications of diabetes and affects the quality of life of diabetic patients. Despite being the gold standard of Charcot's arthropathy treatment, contact casting therapy requires strong adherence to the clinical pathway from both the patient and the medical personnel. We report the case of a 70-year-old male patient with a past medical history of uncontrolled Diabetes Mellitus who initially presented to the ER department of our hospital with a unilateral, swollen, warm left foot with erythema and moderate X-ray abnormalities of his left foot and ankle. He denied any previous traumatic incident. He was placed initially in a non-weight bearing contact cast. However, the patient was not compliant to his treatment and returned to the Emergency Department 4 months later with severe left foot deformity, a disarticulation of the tibiotalar and subtalar joints, and a large open ulcer of the foot. A below-knee amputation was performed. This report will therefore serve as a reminder for clinicians to keep in mind that Charcot arthropathy is a progressive condition that should be treated without delay.

Introduction

Charcot arthropathy is a major delayed complication of diabetes that affects bones, joints and the surrounding soft tissues. In the absence of normal sensation due to diabetic neuropathy, repetitive microtrauma and autonomic vascular dysfunction lead to local inflammation. Consequently, bone resorption and joint dislocation may occur.

Materials and Methods

Our patient was a 70-year-old male who was admitted to our hospital with a painless, swollen, warm and erythematous left foot for 2 months. He denied any previous traumatic accident. His medical history revealed a preexisting uncontrolled Diabetes for the last 4 years. His Glycosylated Haemoglobin (Hb1Ac) level was 10,6%. Anteroposterior and lateral radiographs were obtained that confirmed the articular degenerative changes of his left ankle joint. At that moment no subluxation or any other structural deformation existed. (Figure 1 and 2). Clinical examination revealed a palpable dorsalis pedis pulse and loss of the protective sensation.

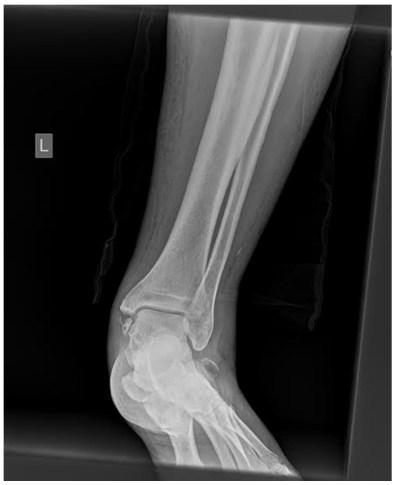

Figure 1: Anteroposterior Radiograph of the ankle joint when the patient was first referred to our department

A total contact cast was chosen as a first line of treatment. The patient was discouraged from weight bearing of his left foot. Casts changes every 2 weeks for the next 4 months were recommended. However, the patient was not

compliant to the therapy, and he removed the cast after three weeks. He also discarded his crutches and started to fully weight bear his limb.

The patient presented to the Emergency Department of our hospital 4 months later for the first time since his dismissal. He had a sublaxed, swollen, erythematous foot with the presence of an open ulcer sour at the medial side of his left foot. (Figure 3). Radiographs were obtained- Anteroposterior and lateral views and a complete disarticulation of the tibiotalar and subtalar joints was confirmed. (Figures 4,5) Treatment options were discussed with the patient, and a below knee amputation was chosen as the best treatment option.

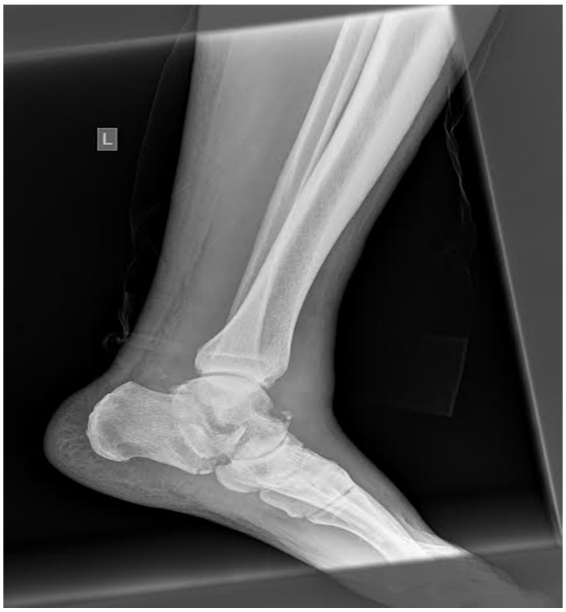

Figure 2: Lateral Radiograph of the ankle joint when the patient was first referred to our department

Discussion

Neuropathic osteoarthropathy of the foot and ankle (Charcot foot) is a disease involving bones, joints and soft tissue of the foot that can lead to a progressive malpositioning and deformation up to complete collapse of the foot [1]. Every part of the skeleton could be affected though foot and ankle Charcot arthropathy remains the most frequent anatomic location. Most commonly, a so-called rocker-bottom deformity – a collapse of the arch in the metatarsus occurs [2]. This malalignment of the foot can cause pressure damage to the skin, open wounds, and secondary bone infection. Similarly, in our case study the patient developed very rapidly this rocket –bottom deformity which led to skin damage and open wound. (Image No 3). The presence of a rocker-bottom foot can increase the risk of a major lower extremity amputation by 15–40 times 2

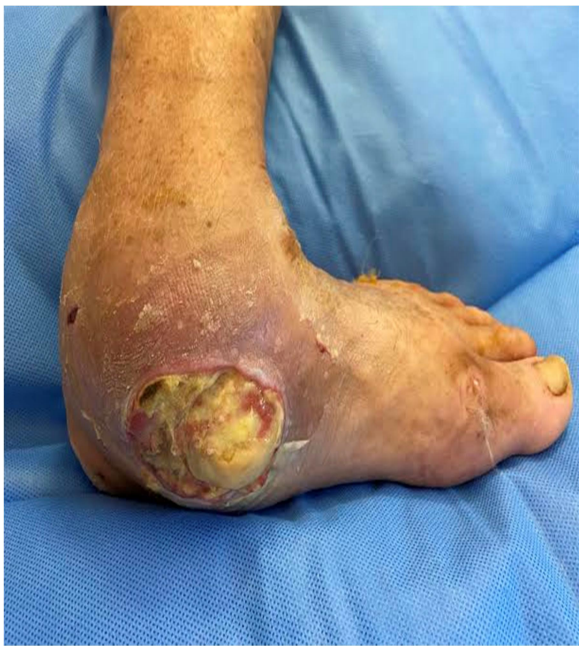

Figure 3: Lateral Radiograph of the foot and ankle joint revealing dislocation and disorientation of the tibiocalcaneal, talonavicular and subtalar joints and an ulcer on the medial side

Hastings et al have made a study looking on radiological progression of foot deformity in charcot patients by monitoring Charcot patients regularly by taking weight bearing x-rays of the foot. Their six-month data suggested worsening of medial column alignment prior to lateral column worsening [3]. This radiographic evidence of worsening foot alignment over time supports the need for aggressive intervention (conservative bracing or surgical fixation) to attempt to prevent limb-threatening complications.

Salvage of Charcot neuroarthropathy complicated by a hindfoot ulcer and osteomyelitis is a complex situation. The aim of surgical intervention in an infected Charcot foot with ulceration is to eradicate the infection and obtain a stable, plantigrade foot that will allow the patient to ambulate with or without orthoses without causing any future ulcerations.

Surgery in charcot foot deformities is usually recommended when infection, unstable joint and recurrent ulceration occurs. However, there is no existing protocol of what type of surgical treatment is required. Various surgical interventions have been described. A combination of talectomy and tibio-calcaneal arthrodesis was described for a Charcot foot deformity, but internal fixation was reserved for cases without foot ulcers and osteomyelitis [4,5,6]. External fixation of the midfoot prior to intramedullary fusion has also been described [7].

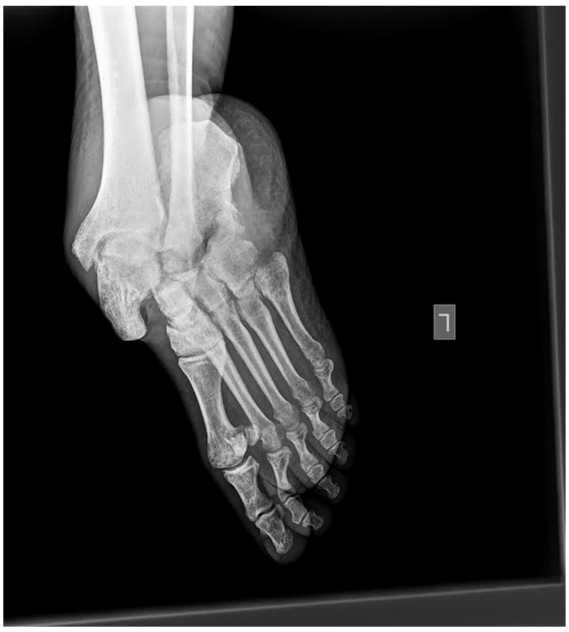

Figure 4: Anteroposterior Radiograph of the foot and ankle joint revealing dislocation and disorientation of the tibiotalar, talonavicular and subtalar joints

Sohn MW et al looked at the lower extremity risk of amputation after charcot arthropathy [8]. Their results were consistent with the current practice guideline suggesting that prevention of ulceration is critical for Charcot limb salvage [9]. Their study also suggested that feet affected by Charcot arthropathy are unlikely to ulcerate when they remain clinically plantigrade and the radiographic weight-bearing relationship between the hind foot and forefoot is collinear [10,11]. These results suggest that amputation risk for Charcot arthropathy may be reduced by reserving corrective surgeries for patients with a high risk of Charcot-related ulceration.

Kucera et al, have analyzed their midterm outcomes of reconstruction of Charcot foot neuropathy in diabetic patients. A candidate for a reconstruction surgery should be a cooperating, compensated, informed diabetic patient with Charcot foot neuroarthropathy, either instable or stable, but non-plantigrade [12]. Our patient was a non-compliant non cooperative patient with a plantigrated talus, therefore a below knee amputation was thought to be the treatment of choise. The patient had a good outcome, and no complications from the wound side occurred.

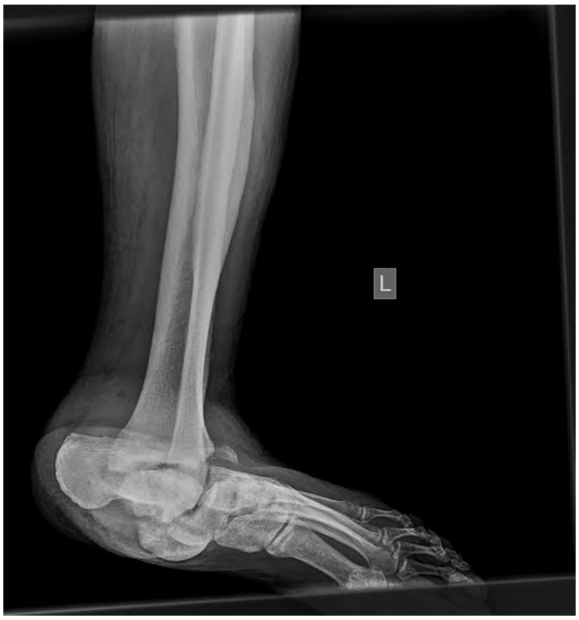

Figure 5: Lateral Radiograph of the foot and ankle joint revealing dislocation and disorientation of the tibiocalcaneal, talonavicular and subtalar joints

Conclusion

Early diagnosis and proper management, although challenging remain the most accurate prognostic factors. Treatment is based on a trial of total contact casting for early Charcot arthropathy stages with excellent results. In the presence of ulcers or skin breakdown and failure of conservative treatment operative management is indicated. Surgical intervention methods include osteotomies, internal or external fixation and amputations. His figure still awaits proper recognition.

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