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Head Transplantation

Sujitha Suresh

Abstract: ***A head transplant or full body transplant is an experiment surgical operation involving the grafting of one organism's head onto the body of another. In many experiments, the recipients head has not been removed, but in others it has been. Experimental in animals began in the early 1900s. as of 2025, no lasting successes have been achieved.***

Keywords: Human head transplant, cephalosomatic anastomosis, spinal cord fusion, transplant ethics, experimental surgery

1. Introduction

A head transplant (CEPHALOSOMATIC ANASTOMOSIS) is an experimental, highly complex surgery to attach a living person's head to a donor body, aiming to save lives with healthy brains but failing bodies (like from cancer/paralysis), facing massive hurdles like spinal cord fusion(the biggest block), immune rejection, and huge ethical/psychological questions, with early animal work showing brief survival but no permanent success, keeping it in sci-fi territory for now despite controversial modern claims. Organ transplantation is a transformative medical procedure that involves transferring healthy organs from a donor to a recipient in need. An exception to this is corneal transplantation, which has a considerably lower rejection risk than other organs, suggesting its potential applicability to other transplants such as skin.[1]

2. Literature Review

The journey of organ transplantation has been marked by significant milestones. The first successful corneal transplant in 1905 by Eduard Zirm paved the way for further advancements.[2] This era has also witnessed exploratory efforts in kidney and tooth transplants and attempts at thyroid gland transplantation. [2,3] While early allotransplantations were largely unsuccessful, sporadic successes provided optimism, hinting at the possibility of success with refined surgical techniques and careful patient selection.[4]

The early 20th century ground-breaking vascular anastomosis technique, developed by Alexis Carrel and Charles Claude Guthrie, which earned them the Nobel Prize in 1912, significantly boosted the prospects for organ transplantation.[5] Despite the initial setbacks, especially in kidney allografts, the recognition of allograft rejection as an immunological challenge has led to substantial progress. The discovery of cyclosporin and the development of newer immunosuppressants have led to complex transplants, including the kidney, liver, heart, and lungs.[6]

The field of transplantation has recently expanded to include face transplants, with the first successful human procedure in France in 2005. The basis of many composite allograft tissue transfers performed today, such as those performed later in the arms, legs, and uterus, were laid in light of these experimental studies conducted in the last century.[7,8] Despite over 35 surgeries to date, face transplantation remains challenging, predominantly due to rejection episodes, with about 80% of recipients experiencing at least one acute rejection episode in the 1st year.[9]

Key takeaways on human head transplants:

1) Human head transplants are also known as CEPHALOSOMATIC ANASTOMOSIS, and at the moment, are not actually possible and likely won't be before 2030.
2) Some researchers have tested a human head transplant on cadavers; they've also been tested on animals. While it may be possible in the future, its still a very difficult procedure, morally and in practice.
3) One of the debates with human head transplant is the moral dilemma of who is who? Does the new head belong to the body or does the old body belong to the new head?

It sounds like pure science fiction. Remove a healthy human head from a dying body, connect it to different healthy body, and bring "THE PERSON'' back to consciousness. Equal parts Frankenstein and futurama it's a premise so bizarre it stretches believability. But perhaps surprisingly a few scientists have argued a human head transplant isn't entirely out of the realm of possibility. Some have even attempted versions of a head transplant in the lab. Nonetheless, many experts argue a head transplant shouldn't be attempted on humans until we've thoroughly grappled with the enormous scientific and ethical hurdles it presents, yet whether or not a human head transplant ever actually becomes feasible, the questions it raises are real- and sometimes deeply unsetting.

What is needed for a human transplant?
Let's get one thing clear from the start. A human head transplant, sometimes called a CEPHALOSOMATIC ANASTOMIS is not currently possible. However, some researchers argue it could be possible in the relatively near future.
In addition to keeping a detached human head alive and viable during the procedure, the surgery would require reattaching dozens of muscles, major arteries and veins, the trachea, esophagus, spinal column and most challengingly, the spinal cord. And the latter is the real deal breaker.

Currently, the intricate and delicate human spinal cord cannot be severed and reconnected in a way that preserves motor or sensory function. Even among patients with spinal cord injuries, regenerative treatments are limited, experimental and largely ineffective.

Who is who after a human head transplant?

The most perplexing element of head transplant might be determining who the donor is and who the recipient is "SAYS

KAREN ROMMELEFANGER" a neuroethicist and founder and director of the institute of neuroethics. "while many of us might equate our identities as the constellation of their relationship.

If you receive a heart transplant, Rommelfanger says, you'll likely say that you are still you.

"but if you receive a brain transplant" she asks "what would you answer be"? The answer really isn't only a scientific one, but one that depends on societal beliefs.

Dog and monkey head transplant:

Although the concept sounds futuristic, scientists have been exploring head transplantation since the early 20th century. In 1908 French surgeon Alexis carrel and American physiologist Charles Guthrie performed THE FIRST DOG HEAD TRANSPLANT. The dog demonstrated some visual and aural reflex movements after the procedure, but it was euthanized condition quickly deteriorated.

In 1954, Soviet Vladmir Demikhov, a pioneer of lung and heart transplantation, also performed a series of controversial dog experiments that involved grafting the head and upper body of a PUPPY ONTO AN ADULT DOG. While the hybrid animals survived as long as 29 days, they eventually succumbed to organ rejection or surgical complications.

Later in 1970, American neurosurgeon Robert white transplanted the head of ONE RHESUS MONKEY onto the body of another. The monkey regained consciousness and could smell, see and hear. It even gnashed at one of white's colleagues. But because the monkey's spinal cord was cut, it was paralyzed from the neck down, and it died after 8 days, due to immune rejection.

WHEN WAS THE FIRST HUMAN HEAD TRANSPLANT?

The first supposed human head transplant experiment came in 2017. When Italian neurosurgeon Sergio Canavero reportedly performed a successful full rehearsal of a head transplant on 2 corpses in China while not a true transplantation (no vital signs were restored), Canavero insisted the procedure showed that such a feat was surgically possible.

The discussions around this human experiment were alarmingly superficial at the time, says Rommelfanger.

Many commentaries were already available about the 'yuck' factor of this or the 'unnatural' aspects of this kind of change "she says" but what was missing was the immediate acknowledgement of basic human rights and dignity concerns for the initial experiments on unnamed study "participants" that Canavero was conducting preliminary studies upon. In short, where are the bodies coming from?

Will we ever do human head transplant?

Even if science catches up and human head transplant become a real option in the future, there are enormous ethical concerns surrounding the procedure that still need to be addressed.

"The biggest concerns are around disrespect for human dignity, lack of appropriate consent and potential for undesirable, even debilitating changes to identity. Rommelfanger says for instance who is the person after a successful head transplant? The individual who owned the body? Or the one with the original brain?

And that's not the only gray area in the case of human head transplants in China" she says its possible that bodies or heads for individuals could come from people who might not really be dead.

In the U.S the uniform determination of death act (UDDA) defines death primarily as the irreversible cessation of all brain activity. But not every country or even state shares that definition.

And then there's the issue of justice.

"Virtually every new technology or intervention that requires expensive equipment and rare expertise is not equitably distributed. This intervention would be no different in that regard" Romen flanger says but there is a unique worrisome kind of exploitation that could happen with even the experimental phases of this work related to consent, or lack thereof. One wonders, where are the bodies coming from for these experiments?

3. Methodology

Core Concept:

1) **Goal:** To give a healthy brain/head a new, healthy body, offering hope for paralysis, severe organ failure, or terminal diseases where the head/brain is unaffected.
2) **Procedure (Theoretical):** Involves cooling both patients, severing the spinal cords and major vessels, connecting blood flow, using special glues/stimulators for spinal fusion, and linking nerves/tissues, followed by intense immunosuppression and a coma.

Historical Context & Challenges:

- Early experiments: Began in the 1900s with rudimentary success in animals (e.g., Robert white's monkey lived hours).
- Spinal cord fusion: The biggest hurdle; current methods struggle to reconnect the CNS for lasting function.
- IMMUNE REJECTION: A major issue, similar to other organ transplants, requiring powerful immunosuppressants.
- ETHICAL & PSYCHOLOGICAL: Raises deep questions about identity, consciousness, and what constitutes a person.

Modern Status (As of 2025)

- No successful, lasting human head transplant has occurred.
- Some surgeons, like Sergio Canavero, have proposed techniques (using fusogens, etc.) to make it feasible, sparking debate but no human trials have shown success.
- Research continues in animal models (mice, dogs) to overcome technical barriers, but it remains distant prospect.

4. Results

There have been no successful human head transplants, and most experts consider them currently impossible due to immense surgical, neurological (spinal cord fusion), and ethical challenges, though early animal experiments showed temporary survival. While some researchers, like Dr. Canavero, proposed plans for human head transplants (body-to- head transplantation or BHT), these remain theoretical, with animal studies only demonstrating short- term viability of the brain, not lasting function or consciousness.

5. Conclusion

- **No Human Success:** No human head transplant has ever been performed successfully.
- **Animal Experiments:** Early experiments on monkeys showed temporary survival and basic senses (sight, smell, hearing) but paralysis, indicating the immense challenge of reconnecting the spinal cord.
- **Surgical Hurdles:** The primary barrier is fusing the brain's spinal cord (nerve cells) to a donor body's spinal cord to restore movement and sensation, a feat far beyond current capabilities.

References

[1] Canavero S. HEAVEN: The head anastomosis venture project outline for the first human head transplantation with spinal linkage (GEMINI). Surg Neurol Int 2013; 4: S335–42.
[2] Cho Y, Borgens RB. Polymer and nano-technology applications for repair and reconstruction of the central nervous system. Exp Neurol 2012; 233: 126–44.
[3] Chen B, Bohnert D, Borgens RB, Cho Y. Pushing the science forward: Chitosan nanoparticles and functional repair of CNS tissue after spinal cord injury. J Biol Eng 2013; 7: 15.
[4] Chen B, Li J, Borgens RB. Neuroprotection by chitosan nanoparticles in oxidative stress-mediated injury. BMC Res Notes 2018; 11: 49.
[5] Gao W, Borgens RB. Remote-controlled eradication of astrogliosis in spinal cord injury via electromagnetically-induced dexamethasone release from "smart" nanowires. J Control Release 2015; 211: 22–7.
[6] Shi R, Borgens RB. Anatomical repair of nerve membranes in crushed mammalian spinal cord with polyethylene glycol. J Neurocytol 2000; 29: 633–43.
[7] Shi R, Borgens RB, Blight AR. Functional reconnection of severed mammalian spinal cord axons with polyethylene glycol. J Neurotrauma 1999; 16: 727–38.
[8] Shi R, Borgens RB. Acute repair of crushed guinea pig spinal cord by polyethylene glycol. J Neurophysiol 1999; 81: 2406–14.
[9] Bittner GD, Ballinger ML, Raymond MA. Reconnection of severed nerve axons with polyethylene glycol. Brain Res 1986; 367: 351–5.
[10] Koob AO, Duerstock BS, Babbs CF, Sun Y, Borgens RB. Intravenous polyethylene glycol inhibits the loss of cerebral cells after brain injury. J Neurotrauma 2005; 22: 1092–111.
[11] Shi Y, Kim S, Huff TB, Borgens RB, Park K, Shi R, et al. Effective repair of traumatically injured spinal cord by nanoscale block copolymer micelles. Nat Nanotechnol 2010; 5: 80–7.
[12] Bittner GD, Keating CP, Kane JR, Britt JM, Spaeth CS, Fan JD, et al. Rapid, effective, and long-lasting behavioral recovery produced by microsutures, methylene blue, and polyethylene glycol after completely cutting rat sciatic nerves. J Neurosci Res 2012; 90: 967–80.
[13] Basso DM. Neuroanatomical substrates of functional recovery after experimental spinal cord injury: Implications of basic science research for human spinal cord injury. Phys Ther 2000; 80: 808–17.
[14] Illis LS. Central nervous system regeneration does not occur. Spinal Cord 2012; 50: 259–63.
[15] Ren X, Laugel MC. The next frontier in composite tissue allotransplantation. CNS Neurosci Ther 2013; 19: 1–4.
[16] Ren XP, Luther K, Haar L, Wu SL, Song Y, Shan JG, et al. Concepts, challenges, and opportunities in allo-head and body reconstruction (AHBR). CNS Neurosci Ther 2014;20.