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Advancements in Artificial Organs and Prosthetics: Bridging the Gap Between Biology and Technology

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Abstract

The article explores the intriguing connection between biology and technology in the field of artificial organs and prostheses. It highlights amazing advances such as prosthetic kidneys, hearts, lungs, retinas, and limbs. These advances have altered healthcare and empowered those who have lost limbs or organs. In addition, the essay highlights significant actors in this industry, as well as ethical considerations, privacy concerns, and prospects. While artificial organs hold enormous promise, they create complicated ethical and access issues. Nonetheless, continuous scientific and technical breakthroughs offer enormous promise for improving human capacities, affordability, and lifespan in the realm of artificial organs and prostheses in the future.

Keywords: Artificial Organs, Prosthetics, Bioartificial Organs, Artificial Kidney, Artificial Heart, Jarvik-7, SynCardia, Artificial Lungs, Artificial Retina, Retinal Disease, Argus II, Artificial Limbs, Prosthesis, Organ Transplantation Alternatives, Tissue Replacement, Brain-Computer Interfaces (BCIs), Bionic Limbs, Artificial Pancreas Systems, Biocompatibility.

Introduction

Have you ever wondered what would happen if the blind could see? If the damaged organs in a person's body can be replaced with artificial, yet working ones? While these things may sound impossible it is a reality of the present times. The interface of biology and technology, where inventiveness and compassion merge to change lives, is one of the most enthralling domains in the rapidly growing field of medical research and technology. In recent years, the advancements in these sectors have given escalation to outstanding innovations in the sectors of artificial organs and prosthetics. It was stated by Wang (2019) that organ failures were one of the prime reasons for transience all over the world in the past. Despite the improved pharmacological and clinical treatments, the death rates due to these organ failures were still high. Throughout the years, trials have been made to prolong life by transplanting failed organs, and at present, orthotopic organ transplantation is the only way to achieve this. However, this process is still majorly limited due to problems like high cost, immune refusal, donor deficiency, and moral dilemmas. Later on, with the increasing advancement in science and technology along with the development of substantial processing technology, the area of engineering artificial organs and prosthetics, also known as bioartificial organs, is becoming more and more fascinating. Now, some might think, what are these artificial organs? An artificial organ is an artificially made instrument that can be placed into a human body by connecting them to live tissues in order to exchange a natural organ that has become incompetent. This allows a person with organ failure or such condition to return to their regular life as soon as feasible.

Discoveries

According to Frost & Sullivan (2017), In the year 1982, Jarvik-7, the first completely functioning artificial heart was designed and was to be successfully implemented in a human. After that, some successful inventions have been made and more varieties of organs have been artificially made and transplanted. Among them, some noteworthy discoveries are:

- **Artificial Kidney**

  Kidney failure is common. Patients with this condition can either choose to transplant or opt for dialysis. While both of these options can retain some of the disrupted kidney functions, there are also innumerable drawbacks. As stated by Nagasubramanian (2021), In the year 1943, Willem Johan Kloff introduced the first successful artificial Kidney, "The rotating drum dialyzer". At present, more advanced options are available.

Figure 1: Source: Mir, H. V. (2018). Artificial kidney development leaps forward. *The Oldish*®. https://www.theoldish.com/artificial-kidney-development-takes-leap-forward/

- **The Portable Artificial Kidney: (Harris, 2022)** These are lightweight and battery-driven devices that allow a person to filter blood at any time and place. This ensures frequent wastage removal and dialysis ability anywhere. This can enhance people's lifestyle and make it much easier. AKTIV and The Neokidney are some devices in development.
- **The Bioartificial Integrable Kidney: (Harris, 2022)** The focus of this device is to be implanted via surgery. It would have the ability to stay within the body for several years. This device will comprise a blood purifying unit along with human kidney cells. This device performs all tasks performed by a real kidney such as blood filtration, hormone secretion, blood pressure control, etc.

❖ Artificial Heart

Heart disease can be fatal as it is a significant organ of the body and is common for many. Although there are many medicines to cure heart diseases, they seem to be not very effective. Moreover, in the case of transplantation, the wait for a donor is long and lacks surety of succession. According to Khan & Jehangir (2014), In the year 1969, the first artificial heart was implanted in a human by Dr. Denton Cooley. This device was created using a roller pump that can transfuse blood continuously. It consists of a net-like texture that is like vascular grafts. In the coming years, more developments were made in the area of artificial heart and Dr. Robert Jarvik is known for his successful permanent artificial heart known as Jarvik-7. Later in 1982, the first permanent artificial heart was implemented in a 61-year-old patient. In 2010, the Jarvik-7 was renamed as "SynCardia temporary" which works on a motor with hydraulic and contains two artificial ventricles and corresponding valves. At present, SynCardia has progressed temporarily and it makes the patient's life much easier as it allows them the ability to perform daily activities. Today, SynCardia is the most successful artificial heart.

Figure 2: Source: Corscience GmbH & Co. KG. (2021, December 1). *"ReinHeart" Artificial Heart System: Corscience implements physiological control - Corscience*. Corscience https://www.corscience.com/success-stories/reinheart-artificial-heart-system-corscience-implements-physiological-control/

❖ Artificial lungs

Lung failures are common among people and many lose their lives due to it. Though lung transplant is a useful treatment, its number of limitations such as durability and lack of donors, an interest in the field of artificial lung support has grown. As per Naito et al. (2018), a new interest in artificial lung technologies has been fascinating. Patients suffering from advanced lung failures are at first given support through mechanical ventilation (MV). After that, in case of an even critical situation, full lung support is provided known as extracorporeal membrane oxygenation (ECMO). This device functions like lungs. In this process,the blood flow from the patient is diverted through an artificial lung for gas exchange, and then it is returned to the patient. More advanced artificial lungs are in the making intending to make people's lives a little easier and more comfortable.

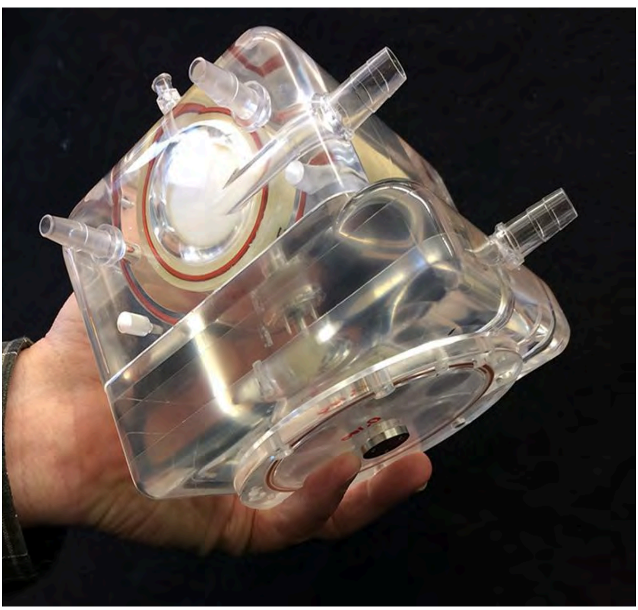

Figure 3: Source : Rieland, R. (2017, April 7). An Artificial Lung That Fits In a Backpack. *Smithsonian Magazine*. https://www.smithsonianmag.com/innovation/artificial-lung-fits-backpack-180962826/

❖ **Artificial Retina**

As stated by Farvardin et al. (2018), Retinal disease is a common yet serious widespread disease that results in vision loss as well as permanent blindness. The number of people suffering from retinal disease is constantly rising and is expected to triple by the year 2050. In these circumstances, one can only rely on technology for cures. Artificial retina, which when integrated in the eyes, allows the blind to see. In 2013, the first implanted device to treat adults with retinitis pigmentosa known as Argus II was approved by FDA. This device is surgically implanted in a patient. After implanting, patients are required to return after a certain time to program and customize the software according to their needs. This device consists of a receiver, electronic, and an electrode array, implanted in and around the eye. Argus II helps improve alignment and movement. It helps to determine people and understand their position. A patient with Argus II implanted can differentiate between colors and shapes. This is a fascinating invention so far and at present is actively being available to more and more patients.(American Society of Retina Specialists, n.d.)

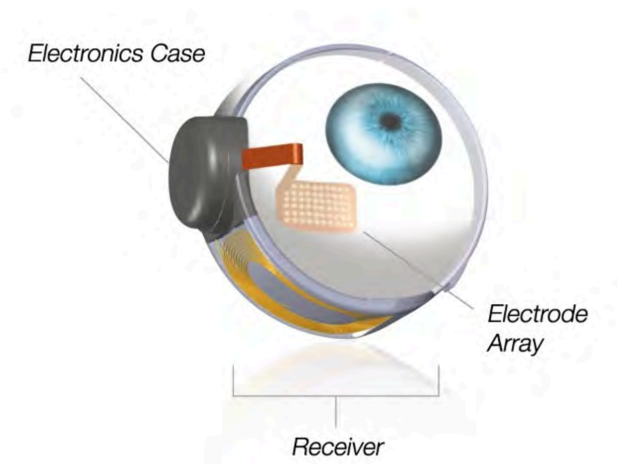

Figure 4: Source: Greenemeier, L. (2013). FDA approves first retinal implant. *Nature*. https://doi.org/10.1038/nature.2013.12439.

❖ Artificial limbs (Prosthetics)

In case of a missing body part in any individual, an artificial device is used and in medicine, this is known as a “Prosthesis”. Prosthetics can be removable which allows a person to change it from time to time or have different ones for different tasks. E.g., Artificial Hand. There is also another type of prosthetics that are permanently integrated, such as artificial teeth. The use of prosthetic limbs has been going on for a long time. Only in 1948, the electric version of such prosthetics was introduced and in 1960 the first clinical myoelectrical prosthesis was revealed. According to the article *Prosthetics | Artificial Limbs | Limb Replacement for Amputees* (2021), Prosthetics can be of three types:

- **Cosmetic Prosthetics:** Cosmetic prosthetics are external prosthetics where the main aim is to provide a life-like depiction of an absent body part, which often doesn’t have any functional roles.
- **Body-Powered Prosthetics:** Body-power prosthetics are a great tool that can restore movement such as picking up and holding objects. These prosthetics allow the muscles around it to control the device’s cables and enable movement. Though it can control one movement at a time, it provides a greater amount of freedom to its users.
- **Myoelectric Prosthetics:** The myoelectric prosthetic is the most functional device for an individual. It gives a patient the same experience as regulating the nerves of the same body part. When the device receives the action abilities, it applies a rechargeable battery to increase the electrical signal while using the electric signals to drive the motors that move each separate part of the limb. This gives more freedom and spares the person from having to make recurring and exhausting muscle contractions.

Figure 5: Source: Staff, H. (2021, March 25). *The science behind fabricating prosthetic hands and arms*. Horton's Orthotics & Prosthetics. https://www.hortonsoandp.com/the-science-behind-fabricating-prosthetic-hands-and-arms/

Prosthetic limbs are essential to people who have lost a body part due to any disease or accidents or during birth as these can help them reestablish the abilities that were lost. While these prosthetics cannot fully copy the limb's functions, it's still advancing for the better and will be functioning more like real limbs due to recent significant developments.

Current Applications & Interests

The combination of biology and technology has yielded remarkable progress in the advancement of artificial organs and prosthetics. These advancements have transformed the lives of millions of people worldwide, providing solutions to organ failure and limb loss. Artificial organs and prosthetics have current applications in various fields. These applications advance healthcare, technology, and human capabilities. Some of the current applications are:

- **Medical Applications**
  - Organ Transplantation Alternatives: Artificial hearts, kidneys, lungs, and other organs serve as life-saving alternatives while patients await organ transplants.
  - Tissue Replacement: Bioengineered tissues and organs offer potential solutions for patients in need of replacements for damaged or diseased tissues.
  - Limb Replacement: Prosthetic limbs, including advanced bionic and myoelectric devices, restore mobility and functionality to individuals with limb loss.
  - Treatment of Organ Failure: Artificial organs can provide temporary or long-term solutions for organ failure due to conditions like heart failure, kidney disease, or respiratory disorders.
- **Brain-Computer Interfaces (BCIs)**
  - These are devices that allow directly connecting the brain with a computer or other extrinsic equipment. (Saha et al., 2021)
  - BCIs enable individuals with paralysis to control robotic limbs, computer interfaces, and communication devices using their thoughts. These systems enhance the independence and communication abilities of users.
  - They provide increased flexibility by either usurping or boosting human outer functioning potential. (Saha et al., 2021)
- **Prosthetic Limbs**
  - Bionic Limbs: Advanced prosthetic limbs, including bionic arms and legs, provide users with natural movement and sensory feedback, enhancing their mobility and quality of life. (Fleming et al., 2021)
  - Myoelectric Prosthetics: Myoelectric prostheses are controlled by muscle signals, allowing users to perform precise and coordinated movements.
- **Sensory Restoration**

According to Kleinlogel et al. (2020),

  - Cochlear Implants: Cochlear implants rehabilitate hearing in persons who are facing extreme deafness by precisely reviving the auditory nerve.

- ➢ Retinal Implants: Retinal implants rehabilitate vision for people with specific kinds of blindness, i.e. retinitis pigmentosa.

❖ **Orthopedic Prosthetics**

As per Bashir et al.(2022),

- ➢ Prosthetic devices for lower limbs, such as below-knee and above-knee prostheses, enable amputees to walk and perform daily activities with greater ease.
- ➢ Ankle-foot orthoses (AFOs) provide support and improve mobility for individuals with foot drop or other gait abnormalities.

These present applications demonstrate the various and ever-changing uses of artificial organs and prostheses to improve healthcare, human capacities, and overall quality of life for persons with medical conditions and disabilities.

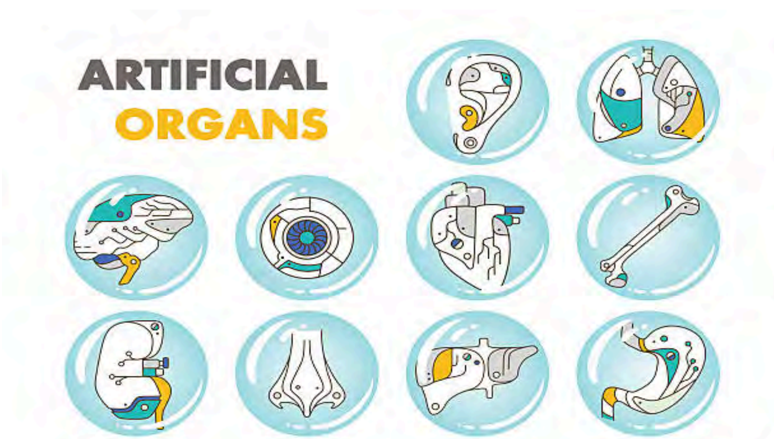

Figure 6: Source: Cartoon_Based_Lifeforms. (n.d.). *Flat icons - artificial organs. EPS 10. Isolated objects*. iStock. https://www.istockphoto.com/se/vektor/flat-icons-artificial-organs-5-gm593300008-101804599

Moreover, many companies and research institutions across the world are engaged in the development and advancement of artificial organs and prosthetics. These organizations are at the frontline of revolution in bridging the gap between biology and technology.

- **Medtronic**

Medtronic is a global medical technology company, specializing in the creation of artificial organs and devices. They've made life-saving gadgets like pacemakers, artificial heart valves, and insulin pumps in the past (Medtronic, n.d.).

- **SynCardia Systems**

The Total Artificial Heart (TAH), manufactured by SynCardia, is a device intended to temporarily take the place of the human heart. For patients awaiting a heart transplant, it serves as a transitional procedure (Copeland, 2013).

- **Ossur**

An Iceland company, Ossur is a leader in the field of prosthetics and orthopedic devices. They are known for their advanced prosthetic limbs, including the Proprio Foot, which uses sensor technology for a more natural gait (*About Össur*, n.d.).

- **Deka Research and Development**

The DEKA Arm, a highly sophisticated prosthetic arm with several degrees of freedom and natural movement, was created by the Deka business. The Department of Veterans Affairs and DARPA both provided funding for its development (Resnik et al., 2014).

- **ReWalk Robotics**

ReWalk Robotics creates wearable exoskeletons for those who have suffered spinal cord injuries. These technologies let people stand, walk, and explore their surroundings independently. (ReWalk Robotics, 2023)

- **University of Pittsburgh - Rehabilitation Institute**

This research institute has made major contributions to the fields of brain-computer interfaces (BCIs) and neural-controlled prosthetics, working on technologies that allow people who are paralyzed to operate robotic limbs with their thoughts (Young et al., 2021)

- **Stanford University - Stanford Biomechatronics Lab**

This Stanford lab is dedicated to the development of cutting-edge prosthetic limbs and exoskeletons, with a focus on improving user comfort and control. (*Biomechatronics Laboratory*, n.d.)

To conclude, these organizations are pushing the boundaries of what is feasible in the realm of artificial organs and prosthetics. Their transdisciplinary collaboration and technological developments are bridging the biology-technology divide.

Methodology
Various surveys and interviews with patients and medical professionals as well as researchers are conducted to understand the challenges related to organ failures along with limb loss and various healthcare requirements. Different existing medical data, patient results, and medical experiences are also evaluated to mark the specific area that needs to be improved.

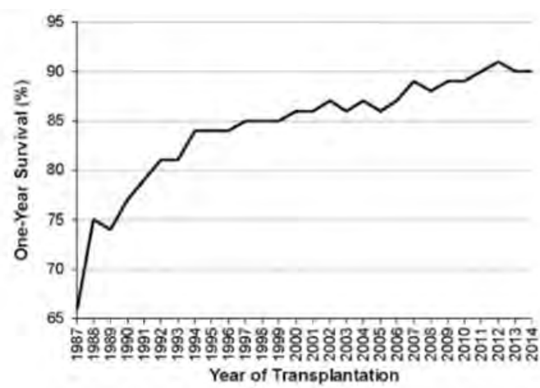

Figure 7: Source : The one-year survival rate of liver transplantation graph exhibits a significant rise from 1987 to 1994, then followed by relative stability.

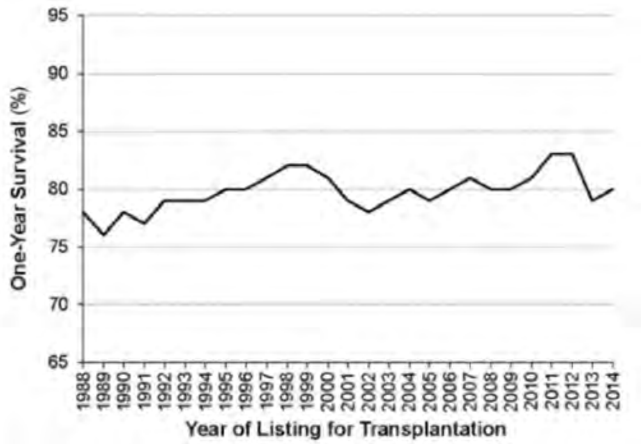

Figure 8: Source: From 1988 to 2014, the one-year intent-to-treat survival rate of the liver transplantaion graph is unchanged.Rana, A., & Godfrey, E. L. (2019). Outcomes in Solid-Organ Transplantation: Success and stagnation. *Texas Heart Institute Journal*, *46*(1), 75–76. https://doi.org/10.14503/thij-18-6749

Moreover, numerous existing research articles, scientific literature, and patient cases related to artificial organs are thoroughly reviewed and gaps in knowledge, emerging trends, and areas with potential for development are identified. Furthermore, some clinical data are collected and analyzed to determine the effect of technology on artificial organs and prosthetics as well as consider strategies to make this technology accessible to a wide population including those with low resources.

Convergence of Biology and Technology

The convergence of biology and technology has aided in the advancement of artificial organs and prostheses. According to Bronzino & Peterson (2016), The following are key components of this convergence:

❖ **Biomaterials:** Biomaterial advancements have been critical in the creation of artificial organs and implants. Biocompatible polymers, metals, and ceramics have enabled the development of long-lasting and safe implants. Researchers are also investigating the usage of biodegradable polymers that can be absorbed by the body without causing long-term problems.

- ❖ **Bioinformatics:** Bioinformatics has enabled accurate contriving and intimating biological processes, assisting in configuring and optimizing artificial organs. Researchers can use computational tools and algorithms to examine complicated biological data and imitate the activity of organs or prosthetic devices within the body.
- ❖ **Tissue Engineering:** Tissue engineering blends biological and engineering concepts to generate functioning, live tissues. This approach is especially relevant to artificial organs thus it tries to create organs or components that closely resemble their natural counterparts. Tissue engineering has been transformed by 3D printing and bioprinting technologies, which enable the fabrication of complex structures with cell-based components.
- ❖ **Sensing and Control Systems:** Natural movement and feedback are enabled through the integration of sensor and control systems in prosthetics. Microelectronics and neural interface advancements have enabled prosthetic devices to be connected directly to the nervous system, allowing users to operate their mechanical limbs with astonishing accuracy.

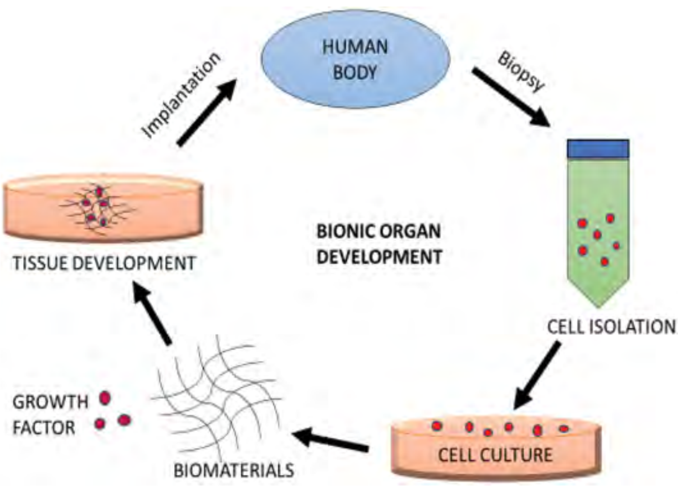

Figure 9: Source : The creation of an artificial organ: Shanmugam, D. K., Anitha, S., Souresh, V., Madhavan, Y., Sampath, S., Venugopal, D. C., & Saravanan, M. (2023). Current advancements in the development of bionic organs using regenerative medicine and 3D tissue engineering. *Materials Technology*, *38*(1). https://doi.org/10.1080/10667857.2023.2242732

Advantages

Advances in prostheses and artificial limbs have enabled people with various illnesses, accidents, or disabilities to experience a major improvement in their quality of life. These developments are bridging the biology-technology divide in several ways, providing many benefits:

- **Improved accessibility and sustainability**

As per Wang, 2019 and Sohn et al., 2020**,** Advances made in Technology and Biotechnology have led to the development of advanced limbs, enabling them to function like natural organs along with compatible materials that have reduced the risk of tissue rejection. As a result, the prosthesis blends more naturally with the body reducing various discomforts and helping the users perform a greater task.

- **Individualized ideas**

Advances in 3D printing and scanning technology are now creating prosthetics and artificial limbs to fit each patient's specific anatomy. These customizations improve the fit and functionality of these gadgets. (Zhu et al., 2021)

- **Improved lifetime along with Decreased health risk, disability, and pain**

Prostheses are stronger and last longer, requiring fewer replacements or repairs. Side by side improved materials and technology are reducing the risk of prostheses and prosthesis-related complications, infections, and other health problems as well as pain and weakness through a variety of treatments (Surgeons., 2002). A prosthetic limb, for example, helps an amputee walk pain-free and lead a more active life. (Klak et al., 2020)

- **Economic benefits**

Such scientific developments have many positive effects on the economy. First and foremost, manufacturing and marketing prostheses have led to a thriving industry, furthering study, innovation, and job prospects. This expansion has helped industry research firms, medical device producers, and biotechnology firms. The improved quality of life for those who can now afford state-of-the-art prostheses also has a significant financial impact. (Horrocks, 2022)

- **Research possibilities**

Research and innovation in areas such as tissue engineering, regenerative medicine, and neuroprosthetics have been stimulated by the development of artificial limbs and prosthetic limbs. Beyond prosthetics, a wide range of medical fields could benefit from these developments in several ways. (Future Visions: The Future Possibilities of Artificial Organs, 2023)

- **Scientific advancement**

A significant step in the development of prosthetics as well as artificial organs is bridging the biology-technology divide. Through these developments, we leverage our knowledge of biology, including tissue engineering, biomaterials, and medical imaging, to create cutting-edge prostheses and prosthetic devices. For example, regenerative medicine has made it possible to create bioengineered organs such as artificial hearts and kidneys, while 3D printing and nanotechnology have made it possible to create personalized and highly functional artificial organs. (Altınörs, 2021)

Complications

Learn more about some of the limitations and pitfalls involved in the development of artificial limbs and prosthetics:

- **Cost issues**

Access to these advanced life-changing technologies is limited because of the high costs connected with the design, manufacture, and maintenance of sophisticated prostheses and prosthetics. Finding solutions to reduce production costs keeping in mind patient affordability is now an important task. (Malchesky, 2001)

- **Compatibility And Biocompatibility issues**

Despite great progress, total biocompatibility is still difficult to achieve. Moreover, when some manufacturers make individual parts for prosthetic limbs or prosthetic systems, various interoperability issues can arise. Various adjustments are crucial depending on the comfort of the users and the functionality of the device. (Masci, 2022)

- **Limitations of sensory**

Replicating the complex sensory functions of real limbs and organs in artificial devices has not yet been very successful. These devices need further advancements to give people more realistic and better results. (Wan et al., 2019)

- **Complicated surgical operations**

A variety of complex and invasive surgeries are often required when implanting a prosthesis or device. Advances in robotic surgery and minimally invasive surgical procedures can reduce risks and speed recovery. (Sabbih & Kulabhusan, 2021)

- **Fixed life expectancy**

Various prostheses and prostheses have a limited lifespan and may require replacement or maintenance from time to time. Practicing predictive maintenance and extending the life of these devices can reduce the hassle and cost of additional. (De Jongh et al., 2022)

- **Limited self-reliance**

A few prostheses require external regulator structures or current health professional supervision, which limits the user's degree of autonomy. The development of autonomous and self-regulating technologies can enable users to become more successful and independent. (De Jongh et al., 2022)

- **Research deficits**

Although prosthetics and prosthetics research has advanced significantly, these limitations in means of spending on ongoing research and development must be addressed. To foster innovation, it involves multidisciplinary collaboration between biologists, engineers, material scientists, and doctors. (Aman et al., 2019)

Researchers, engineers, healthcare professionals, policymakers, and patient advocates must work together to overcome such barriers. It is expected that continued developments in technology, materials science, and medical research will remove many of these restrictions, making prostheses and prostheses more widely available, efficient, and adaptable to individuals' lifestyles.

Analysis & Controversies

According to Bunnik et al. (2022), While advancements in artificial organs and prosthetics hold immense potential, they are not without their share of analysis, controversies, and ethical considerations. Here, we delve into some of the key points of contention and discussions surrounding this field:

- **Ethical Concerns:**
    - Resource Allocation: The cost of developing and implanting artificial organs and prosthetics can be substantial. Ethical conundrums arise regarding resource allocation, because these technologies may not be accessible to all individuals, potentially increasing various healthcare disparities.
    - Improvement vs. Medication: Enhancement of prosthetics and bionics become more advanced, questions emerge with a doubt about whether these technologies should primarily serve as medical treatments or if they can be utilized for human enhancement, raising ethical debates about the definition of "normal" *Homo sapiens* capabilities.
- **Safety and Long-Term Risks: (Bazaka & Jacob, 2012)**
    - Lifetime: Some prostheses have a limited lifespan which requires a replacement of the patient's life.

This increases concerns about the frequency of invasive tumors and their associated dangers.

- Nerve Connections: Integration of artificial limbs and prosthetics with neural interfaces may raise privacy concerns. Access to individuals' neural data can be exploited which leads to potential breaches of privacy and misuse of personal details.

- **Autonomy and Consent:**
  - Approval Information: Informed consent is often required from patients for the placement of advanced technologies such as prostheses. Confirming that patients completely understand the threats, advantages, and associations of these technologies can be challenging, especially when trading with unsafe citizens.
- **Cultural and Societal Impact:**
  - Self Image and Identification: The use of artificial limbs and prosthetics can affect a person's body image and sense of identification. Social viewpoints towards people with noticeable prosthetic augmentation may change, potentially leading to issues of taking and inequity.
  - Community-based Principles: As these technologies become more ordinary, community-based norms regarding disorder, individual machine integration, and human ability may develop, leading to debates about "normal" means.
- **Technological Limitations:**
  - Control Biological Difficulty: Artificial organs and artificial materials must replicate the difficulty of essential biological systems. Achieving this level of experience is challenging, and technology limitations can lead to substandard results or complications.
- **Regulatory Frameworks:**
  - Confirm Security: Regulatory agencies face the challenge of evolving and tooling strong mistakes and security standards for prosthetic limbs and prosthetics to ensure their security and benefit.
- **Psychological and Societal Impact:**
  - Depending on Technology: There is a threat that persons who rely on prosthesis or artificial devices

may become dependent on technology, potentially leading to emotional challenges related to identification and self-sufficiency.

- Unexpected Outcomes: The combination of advanced technology into the human body can lead to unintended consequences, such as changes in human actions, social direction, and the environment. These findings may raise concerns and debates.

To summarize, improvements in prostheses and prostheses provide great benefits but sometimes lead to heavy debates and disagreements such as safety issues, privacy issues, and access and equity. As technology develops, it is essential to consciously address these issues to confirm that new technologies are developed and applied in ways that benefit all of humanity.

Future Prospects

Artificial organs and prosthetics are a matter of great interest to many. Currently, a great number of advancements can be seen in this sector. Moreover, additional developments are being introduced and are on the way. According to the article *Future Visions: The Future Possibilities of Artificial Organs* (2023), Artificial stomachs, livers, pancreas, sensory organs, etc., can all be artificially made and are mostly still in testing phases. A certain number of limitations needs to be surpassed and that is the main aim for these artificial organs. Certain objectives for the future are:

- Improving human abilities so that the users can perform tasks that are more than what natural organs and limbs can do.
- Ensuring the availability as well as affordability of these prosthetics and artificial organs.
- Increased lifespan and functionality of these devices.
- Overcoming the limitations of organ transplantations like a rejection of organs, the possibility of infections, and other serious complications.

While these features are being integrated into artificial devices, more technological advancements are also in progress. It can be observed that the future of artificial organs and prosthetics is promising and is committed to making the lives of individuals around the world easier.

Conclusion

To conclude, advances in artificial limbs and prosthetics review an interesting intersection of biology and technology, where creativity and sympathy collide to improve life. These discoveries have overcome considerable medical difficulties, providing treatment for organ failure and organ damage that were previously thought to be complex. Despite improvements in pharmacological and therapeutic therapies, organ failure has really been a primary cause of death worldwide. Although orthotopic organ transplantation has saved lives, it has been inhibited by difficulties such as cost, immunological refusal, donor shortages, and ethical issues. However, with significant improvements in science, technology, and operating capabilities, creating bioprostheses has emerged as an fascinating and encouraging avenue. Prosthetics, which are man-made devices incorporated into the human body and attached to living tissues, have the ability to replace defective natural organs, allowing patients to restart normal lives.To guarantee that these discoveries benefit all of mankind in this quickly growing sector, it is crucial to address the ethical, social, and technological concerns deliberately, with the participation of stakeholders from varied backgrounds. The future of artificial organs and prostheses promises an enticing path toward better healthcare and human potential.

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Jubaida Niyasa Chowdhury, an ardent and creative undergraduate biotechnology student at Brac University. With an innate interest in innovation and an insatiable curiosity in the field of biotechnology, she wants to explore intersections between biotechnology and creativity along with technology. She is dedicated to learning more and discovering the uncharted territories of biotechnology. She envisions a time in the future when innovation and science coexist harmoniously, pushing the limits of biotechnology.

Rejwana Habib Ome, an enthusiastic undergraduate, is working towards a degree in biotechnology. She has actively participated in a variety of research initiatives throughout her academic career since she has a great interest in scientific discovery. Her interest in biotechnology first arose in high school and has only been greater since then.