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Anatomy acts concerning body and organ donations across the globe: past, present and future with a special emphasis on the indian scenario

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Abstract: From the era of pre-historic times, the ancient Indians and the Greeks highlighted the importance of body and organ donations thereby emphasizing the need for anatomical sciences in medicine through the use of effective dissections for the same. However, after the Renaissance, there was a surge in dissections throughout the world, particularly in Europe, as a result of which various laws were enacted by governments concerning the procurement of bodies for the purpose of scientific dissections, which were later promulgated throughout the world through various anatomical acts. The situation in India was quite similar to that of Britain until its independence in 1947, after which different Indian states formulated their own anatomy acts that had their own merits and pitfalls. Hence, this literature review serves to highlight the various acts throughout history and would serve as a guide to emphasize the future perspectives of formulating a centralized unified anatomy act for the Indian nation that could possibly be the need of the hour.

Key words: Acts, Cadaveric donation, Cadaver, Coroners and medical examiners, Medical examiners

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Introduction

The practice of willful body donations and the art of procuring cadavers for scientific dissections are closely interrelated both culturally and ethnically, despite subtle geographical constraints that might exist in a region [1-5]. Since prehistoric times, voluntary body donations for anatomical studies have been regarded as noble deeds. However, over time, due to the rampant increase in unethical practices concerning the same, many were led to reconsider such practices as either uneventful or ignoble [2-6]. However, in certain cultures, the positivity of body donations for scientific studies was maintained, albeit with significant negative ethical consequences on public perception. Those societies eventually realized how important it was to regulate these practices in a suitable manner through appropriate laws, that resulted in the formation of acts concerning the same [1-7].

Hence this literature review is written with the sole purpose of giving an insight to the reader about the various anatomy acts concerning whole body or organ donations in India and abroad, with a particular emphasis on their historical, current and prospective developments. The other purpose of this review would also be to highlight the sequence of evolvement of various acts concerning body donations throughout the course of history and thereby arriving at a rational approach to help propose a supposed schemed plan for a centralized national Anatomy Act that would overcome

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the pitfalls of the previous acts.

Review

Pre-historic body/organ donations and its applications

The Vedic Indians of pre-historic ancient India could be aptly considered the pioneering forefathers of willful body donations and organ donations as their knowledge of medical sciences and anatomy was so advanced that they had the ability to even regrow their willfully donated body parts using rejuvenated stem cells [1, 2]. As shown in the Ramayana and the Ravana Samhita, the wisdom of the great legendary King Ravana was so immense that he used his arm muscles to build a musical instrument called the "Ravahattha" that could produce such fine music that his master Shiva was calmed and appeased by it at the Kailash mountain [1-3]. This is one of the earliest written pieces of information concerning voluntary organ donation documented in ancient Indian texts [1-3]. Ravana could also regrow his arm muscles again by using the power of harnessed umbilical cord pluripotent stem cells that were stored under his umbilicus throughout his life with the help of Brahma's intervention [3, 4]. Those stem cells were often referred to as immortal elixirs in Vedic texts [1-3]. Another ancient piece of literature containing the documentation of willful whole-body donation is mentioned in the Bhagavata Purana, that dates back to prehistoric Vedic India, wherein the great sage Dadhyancha sacrificed his bones to Indra - the king of the immortal celestial beings, in order to shape the "Vajra weapon" that had the ability to wield thunder and could annihilate the opponents, thereby protecting the heavenly realms from falling into the hands of equally abled adversaries [3, 4].

The Sushruta Samhita is another unique piece of literature contained within the Atharva Veda that is considered to be an ancient Vedic treatise on surgery and medicine, written around 500 BCE [1-3]. It gives us a detailed account of the works of the renowned Indian surgeon Sushruta wherein he procures willfully donated cadavers for dissections and emphasizes the importance of dissection as the profound source of knowledge in medicine and surgery. Most of his ancient surgical techniques in plastic surgery still hold relevance to this day [2, 3]. Sushruta also emphasized the fact that a good clinician is formed only through his or her sound perseverance and knowledge of the anatomical sciences [3, 4]. All these writings from Vedic literature show us that the ancient Indians were well versed in the art of body-part organ donation and it is possible that they might even have formed regulatory laws concerning the same [2-4]. Even though there have been other ancient cultures and civilizations that flourished contemporarily to that of the Indian civilization, there are no written records concerning body donations from those civilizations yet as compared to those of the Vedic Indian ones, except for a unique documented piece of work written by the Greeks in papyruses dating back to the third century BCE, wherein they stress upon the works of a physician named Herophilus, who conducted systematic human dissections under royal patronage and was the first to start a new school of thought regarding the experimentation of the inner aspects of the human body through dissections of donated bodies [3-6]. The Egyptian papyruses dating back to 300 BCE however, lay emphasis on the arts and techniques of body preservation and mummification rather than voluntary body donations per se [4-6].

Later historic acts concerning body donation

Apart from the Indians and Greeks, who had already established their works on body donations during the prehistoric ages, no other cultures made a significant contribution to it during the later historic periods [4-6]. In fact, most works involving body donations for anatomical purposes were strongly discouraged, as donating a body or procuring a dead body from the grave for the purpose of scientific dissection was considered a bad omen in the latter part of history [4, 5]. The Roman physician Galen conducted dissections of animals around 130 AD, believing their anatomy to be similar to that of humans, but was misled by false notions of hypothesized anatomy that eventually led to the stagnant downfall of anatomical dissections and body procurement throughout the dark middle ages in Europe [4, 5, 7]. It was only in the 12th century AD that a revival in human dissections for the purpose of anatomical studies could be significantly seen as it was supported and funded by the Church and its clergy [6, 7].

From 1514 to 1564, Andreas Vesalius, an anatomist of noteworthy importance, conducted the first scientifically established human dissections for learning medicine through anatomy and challenged the existing Galenic views on assumptionary medicine [5-9]. Hence, he is aptly regarded as the 'Father of modern anatomy' [6, 7]. As a result of the significant work done by Vesalius, medical schools of dissection began to be established (as shown in the timeline of events in Fig. 1), and this in turn led to an increased demand

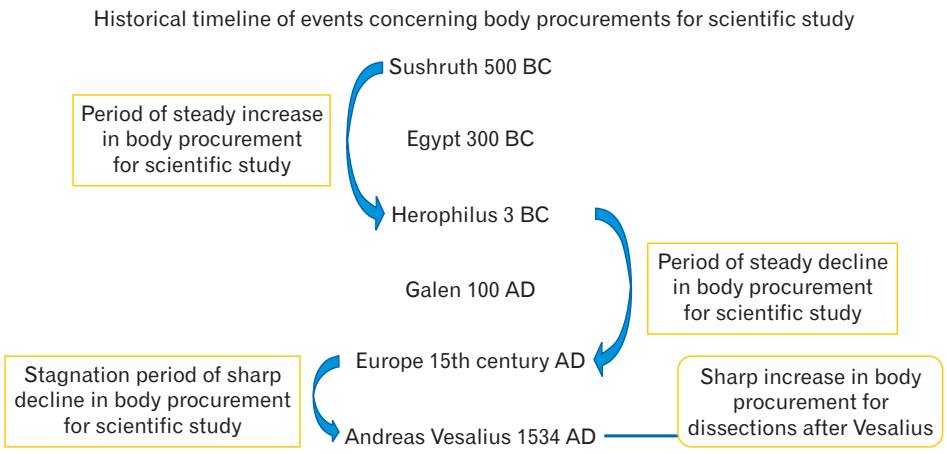

Fig. 1. A timeline of pre-historic and later historic course of events showing the gradual evolvement of body procurements for scientific dissections – solely prepared by the authors.

for cadavers in Europe [7, 8]. This ultimately paved the way for slave bodies to be found by skilled grave robbers. These robbers were known as body snatchers, who sold dead bodies for money to criminal gangs by murdering the poor and destitute [5-8]. These criminal gangs would then sell these bodies at exorbitant rates to medical schools [6-9]. A notable example of body snatching is the case of Burke and Hare, who killed 16 people and sold their corpses to Dr Knox for dissection [7, 8]. The reason behind this swift increase in body snatching during the 16th century AD was the fact that laws in Europe at that time allowed corpses to be treated only as commodities rather than elements of ethical value; hence, body snatchers could easily escape punishment for their crimes [8-11].

Enactment of laws worldwide

The Murder Act of 1752 was the first law concerning cadaveric body procurement to be enunciated and passed by the British government across the British Isles and its colonies, including the Indian subcontinent that was then under the governance of the British East India company [9, 10]. It allowed the public dissections of executed prisoners for scientific studies, due to which a sense of fear arose among the antisocial elements in refraining from committing heinous crimes such as body snatching, as the thought of dissection of oneself after committing such crimes was considered to be a more malicious punishment than imprisonment [11]. This act was not only very effective in reducing the unruly body snatching practices that were prevalent at the time, but it was also the first to establish ethical standards for the same [12, 13]. However, this act lacked clarity on the kind of personnel designated to perform anatomical dissections of executed people, as a result of which many fraudulent groups started setting up their own anatomical schools without proper licensing to procure executed bodies for dissection, and this eventually led to utter chaos and a reflex increase in false testimonies against poor, helpless prisoners by the rich to execute them and utilize their bodies for supplying medical schools [11, 12, 14]. Hence, this act failed to fulfil the objectives for which it was actually meant for.

The Anatomy Act of 1832, which was passed by the British parliament, provided a solution to the aforementioned issue of confusion regarding the unauthorized handling of dissections by fraudsters [13-15]. This act gave license to doctors, surgeons, anatomists, and bonafide medical students to perform dissections on voluntarily donated cadavers for scientific studies [14-16]. This was the first proper legal act to be followed throughout Europe. All British colonies, including India, promulgated and followed this act in medical schools throughout the 19th century. Even countries like the USA and New Zealand adapted this act into their medical universities after making subtle changes to the same [14-16]. Even after the Indian independence from the British Raj in 1947, this Anatomy Act still remained in medical universities throughout India until 1949, after which different Indian states formed their own anatomy acts for body procurement [16, 17]. This act was modified into the Bombay Anatomy Act of 1949 in India, wherein the components of the British Anatomy Act were thoroughly adapted and a few extra modifications were made to it [15, 17]. The main disadvantage with the British Anatomy Act was that it failed to produce accountability for unclaimed bodies. It also failed to designate the person who could certify the death of such unclaimed bodies [17, 18]. The latter problem of death certification was solved eventually by incorporating a modification into the existing Anatomy Act that was known as the Coro-

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ner's Act of 1871 wherein a coroner with the rank equivalent to that of a judicial magistrate was vested with powers to enquire over the cause of death and thereby certify deaths especially in cases of unclaimed bodies to be used for dissections [17-19].

The Indian scenario after independence

In Independent India, the Anatomy Act was enacted by the legislature and published in the state government gazette. Each state was recommended to have such anatomy acts to regulate the donations of unclaimed bodies to the medical institutions for teaching and research [16]. As a result, each state created its own Anatomy Act, some of which underwent multiple iterations.

The Bombay Anatomy Act of 1949 passed in the state of Maharashtra in India, was the first of the state acts to be enunciated into the country [17, 18]. It was also the first act to account for the unclaimed bodies with equal representation on par with that of the voluntarily donated bodies even prior to the establishment of the human tissues act of 1961 in Britain which gave the British anatomists the liberty to use unclaimed bodies or organs for dissections [17-20]. This Bombay Anatomy Act also accounted for the therapeutic use of cadavers which was a revolutionary step in the legal proceedings of cadaveric procurement. This act also served as an inspiration to other states to formulate their own anatomy acts [18-20]. Hence most of the other states included the therapeutic use of cadavers in their respective acts excepting the states of Karnataka, Kerala, Tamil Nadu, Orissa and Uttar Pradesh. Between the years 1949 and 1975, most of the states in India had passed their own anatomy acts as adaptations from the Bombay Anatomy Act and the British Anatomy Act with subtle modifications [15-20].

Though the states in India had their own anatomy acts, the autonomy of voluntary body donations however was grossly neglected as they failed to incentivize the existing government institutions for conducting body donation programs in order to increase awareness among the public regarding the same [16-18]. Hence the promotions of programs related to body donations were largely restricted to licensed private organizations who used their own methods to tie up with certain medical institutions of their choice thereby neglecting the other ones which eventually led to a paucity of cadavers in the anatomy departments of certain institutions [17-19]. The impetus on funeral embalming along with its necessary provisions and funding related to transportation of a cadaver from one area to another are also certain key components of body procurement practices that have not been accounted for by the individual state anatomy acts [17-20]. There are also no clear specifications in these acts regarding the age limit of a near relative or the role of a live-in partner who could willfully give consent for donating a deceased body. Moreover, these acts neither provide a clear consensus regarding the role of a person in lawful possession of a body after death nor do they make provisions for defining an alternative guardian in the case of absence of the near relative of the deceased body [15-20]. The vivid areas where different states vary in their approach towards inclusion of certain key aspects of body procurement are depicted in Table 1 [10, 14, 15, 17].

Most of the state anatomy acts have set a time limit of 48 hours to claim an unclaimed body for donation [15-17]. However, this time limit did not account for the changes of livor or rigor mortis that would have already begun in an unclaimed body once death had occurred in the same [17-19]. The timing of the body's refrigeration post-reception and prior to embalming was also not accounted for in these state acts [16-19]. Though most of the individual state acts defined a near relative who was eligible to claim an unclaimed body, they did not comment on the age of that near relative who could either give or withdraw consent for donating the body either in whole or as organs, irrespective of whether the body was voluntarily donated or unclaimed [16-21]. Some important limitations of various anatomy acts in India are highlighted below.

Limitations

As observed by the authors, no autonomy of donation of the body is accounted for the various state anatomy acts neither are any provisions made far in case no near relative is available at the time of death for body procurement [10, 12]. This is because there is no clear explanation yet about a person in lawful possession of a deceased body in these acts [10, 15]. As not all donations are intended for scientific dissections or research, funeral services rendered towards the deceased also play a crucial role in the promotion of body donations but there are neither any explanations or provisions made to include or justify the need for or against funeral embalming nor are there any provisions made for transportation of the body from state to state [10, 12, 15]. Also there are no inclusions of rigor or livor mortis changes within the time frame of a deceased body's procurement. The mode of proper consent by a near relative for donation of a deceased

Table 1. Varying aspects of discrepancy among the acts of certain states with regards to body procurement/donation

No	State anatomy acts of concerned state	Maximum degree of tolerable collateral consanguinity of a near relative for claiming the dead body [10, 15]	Maximum time period within which a body has to be procured [10, 15]	Accountabilty of the type of person who can claim a deceased body [15, 17]	Accountabilty for voluntary donation of cadavers [15, 17]	Accountability for therapeutic use of cadavers apart from anatomical research [14, 17]	Funeral embalming provisions [14, 17]
1	Maharashtra	Upto 6th	Upto 48 hours	Only near relatives	Included	Included	Under discussion
2	Delhi	Upto 6th	Upto 48 hours	Near relatives as well as friends	Not included	Not included	Under discussion
3	Kerala	Upto 6th	Not included or mentioned	Near relatives or friends or religious bodies affiliated to the deceased person	Included	Not included	Under discussion
4	Orissa	Upto 6th	Upto 48 hours	Only near relatives	Included	Not included	No provisions
5	Tamilnadu	Upto 6th	Not included or mentioned	Only near relatives	Not included	Not included	Under discussion
6	UP	Upto 12th	Upto 48 hours	Only near relatives	Included	Not incuded	No provisions
7	Haryana	Upto 6th	Not included or mentioned	Only near relatives	Not included	Included	No provisions
8	Goa	Upto 6th	Not included or mentioned	Only near relatives	Not included	Included	No provisions
9	Himachal Pradesh	Upto 6th	Least time delay not specified correctly	Only near relatives	Not included	Included	No provisions
10	Karnataka	Upto 6th	Upto 48 hours	Only near relatives	Included	Not included	No provisions
11	Andhra Pradesh & Telangana	Upto 6th	Upto 48 hours	Only near relatives	Included	Included	Under discussion

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Table 2. Important aspects of body donation covered in various acts across the globe

No.	Aspect of body procurement/ donation	North America [22, 25]	Europe [23, 29]	India [10, 17]	Thailand [24, 25]	South Korea [22-26, 29]	Australia [22-26]	Middle east & certain African nations [23-26]
1	Acts/laws governing it	Vested with federal states or provinces	Centralized for the country	Vested with states	Centralized	Centralized	Vested with federal states or provinces	Vested with the religious laws
2	Autonomy	Self willed	Restricted self willed by lawyer intervention	No provisions so far	No provisions so far	Restricted self willed by lawyer intervention	Self willed	Based on the regional religion
3	Therapeutic use of cadavers	Accounted and considered	Accounte d and considered	Considered but not accounted by all states	Not considered	Considered but not fully accounted	Accounted and considered	Based on religious jurisdiction and norms
4	Funeral embalming	Provisions made	Provisions made	No provisions	No provisions	Provisions made	Provision made	Provisions made
5	Transportation cost of cadaver	Provisions made	Provisions made	No provisions	No provisions	Provisions made	Provision made	Provisions made

body is also not properly specified [10, 12, 15, 16].

Body Donations Governed by Vivid Laws Across the Globe

In North America and New Zealand, body donations are governed mostly by regulatory federal laws of the state with vested powers given either to the sheriff or the mayor of the district in the case of procurement of unclaimed bodies [22-24]. As far as Australia and North America are concerned, tremendous impetus is given to the autonomy of the individual with regards to whole body or organ donations wherein the concerned individual is conferred with the rights to make a self attested voluntary will that would be strictly adhered to at the time of his death [23-26]. However the European laws governing body procurement do not allow for the self willed attestation rights of the individual over his or her body donation after death, unless intervened by a lawyer at the time of making a will [22-27]. Such provisions for regulated autonomy in the case of body donations are yet to be made in the various state acts of India. The middle east and certain African nations however, differ from the other regions as their practices concerning body procurement or body donations for scientific purposes fall strictly under the purview of religious doctrines and are governed by the same to a large extent [23-26]. Thailand and the Korean isles have certain limitations over body donations with regards to the gender or age of the individuals [24, 27-29]. Each of their own laws however, have their own short-comings and their respective governments are indeed involved in modifications and corrections for the same. The important aspects of body donation covered in various acts across the globe are highlighted in Table 2 [10, 17, 22-26, 29].

Future prospects and our recommendations

• In this era of One India-One Nation, where the unification of diversity instead of unity in diversity is the prominent ideology, it is high time that we should settle on a Unified Anatomy Act for the entire nation. It can curb various issues arising from the many state acts and bring clarity and unification of rules and procedures.

• Both national and state Anatomical associations must actively work to amend state acts so that a unified Anatomy Act can take their place.

• Additionally, it would be very helpful to set up an online database where medical colleges could list their cadaver requirements and easily report unclaimed bodies. It can avoid wasting potentially valuable cadaveric resources. Also, appropriate protocols and procedures should be set up to move and preserve the cadavers from the collection site to the medical institutions which are in need of cadavers for teaching.

• Online and offline awareness campaigns can be run to educate people about the value of voluntary body donation and to dispel the stigma attached to it. The common man should be encouraged to donate his body to medical education in order to expel the demons of ignorance and produce outstanding doctors and surgeons who will make our nation proud.

Conclusions

States with their own anatomical acts could amend laws based on their own ethnicity and geography which may in-turn lead to ethical violations of the same [16-19, 21]. On the other hand, this could also result in a better coordination between the police personnel and the health care workers within the state [18-20]. However the inter-state coordination and pan-India collaborative procurement of cadavers would be greatly affected [19-21]. Hence the authors believe that a centralized unified Anatomy act for the entire country is the need of the hour by overcoming the pitfalls associated with the various state acts. It should be noted that while formulating a centralized act of cadaveric procurement, provisions have to be made for a body or an organ in such a way that a body or an organ once donated through self-will or through the relatives would not be claimed back lest it would lead to perilous situations [15-19, 21]. India is not only at the forefront but also a centre of medical education in Southeast Asia, having the most medical colleges. Legal reforms can inspire the anatomic fraternity worldwide to conduct critical analyses of their respective Anatomy Acts and act as a torch-bearer for other countries in the region with comparable socio-demographics in obtaining cadavers.

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Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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