

Debate**PART II - HUMAN BODIES TO TEACH ANATOMY: IMPORTANCE AND PROCUREMENT – EXPERIENCE WITH CADAVER DONATION**

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RESUMEN

La publicación del Debate sobre “Cuerpos Humanos para la Enseñanza de la Anatomía: Importancia y Procuración – Experiencia con la Donación de Cadáveres” en el último número llamó la atención de la comunidad anatómica internacional por la amplitud del enfoque y la diversidad de las situaciones mencionadas. Aunque es posible encontrar muchos otros artículos sobre el tema, generalmente se enfocan a una experiencia particular, un país o, eventualmente, a un continente. Este Debate dio una breve visión sobre diferentes continentes y proveyó un rápido punto de vista sobre los acuerdos y diversidad de problemas que afrontan los profesores de Anatomía en una amplia variedad de culturas. Tal como se especificó en la primera parte, los comentarios, consultas y respuestas de los participantes iniciales y los lectores en general serían considerados para una segunda parte del Debate. Todas las contribuciones significativas han sido organizadas e incluidas en esta instancia. Los lectores podrán encontrar información importante relativa a Australia, República Checa, Rusia, Turquía y Venezuela y comentarios adicionales a los conceptos previamente publicados sobre India, Malasia, Sudáfrica y Estados Unidos.

Palabras clave: Enseñanza de Anatomía, material cadavérico, disección cadavérica, donación de cadáveres.

ABSTRACT

Publication of the Debate on “Human Bodies to Teach Anatomy: Importance and Procurement – Experience with Cadaver Donation” in the immediate past issue called the attention of the international anatomic community because of the broad approach and the diversity of the mentioned situations. Instead it is possible to find many other articles on this topic they are usually focused on a particular experience, country or, eventually, a continent. This Debate gave a brief mapping on different continents and provided a quick point of view on agreements and diversity of problems afforded by the professors of Anatomy under a wide variety of cultures. As it was specified in the first part, comments, queries and answers from the initial participants and general readers should be considered as a second part of the Debate. All significant contributions have been organized and included in this instance. Readers may find important information related to Australia, Czech Republic, Russia, Turkey and Venezuela, and additional comments on the previous published concepts about India, Malaysia, South Africa and United States.

Key words: Anatomy teaching, cadaveric material, cadaveric dissection, donation of cadavers.

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Prof. Puranam Vatsalaswamy (India)

I read the article "Human bodies to teach Anatomy: Importance and Procurement - Experience with cadaver Donation". I appreciate the collaborative work that brought faculty together from all over the globe. Such debates are essential not only to know limitations and problems but also to improve upon what we are doing already.

It is heartening to know that everyone feels that cadaveric dissection is essential for imparting knowledge in Anatomy and the other teaching aids only supplement it. The idea of body donation is catching up momentum and many are coming forward. But there is need to propagate the idea of body donation considering the religious beliefs of last rituals especially in rural India. We started with body donation and organ donation camps to bring awareness in the general public. We normally address the senior citizens above the age of 65 yrs. With diverse cultures in India, the onus is on us, Anatomists, to see that the thought of voluntary body donation is being accepted.

We started educating and motivating people initially with small groups and later addressing them in co-operative societies (Gated communities). We plan to visit old age homes too. Though there is no National programme organized efforts are required to increase awareness and change the mindset of the society!

Prof. Rajendra Somnath Garud and Dr Namita Alok Sharma (India)

We would like to put forward certain points noted while reading the article. An appropriate response by the concerned author (when applicable) would be welcome.

- It is heartening to note an apparent universal consensus on the indispensability of cadaveric material as a teaching resource for human anatomy. Alternative forms of training, as some of the medical institutions at Columbia who do not use cadaveric dissection in their teaching methodology are, in all probability, due to their inability to procure cadavers; such methods should thus be, at best, mere adjuncts.

- Voluntary donations appear to be the major resource of this precious teaching material in most of the countries. It is thus interesting that in the last 50 years not a single donated body has found its way into the medical school at Lagos of Nigeria. This is obviously an off shoot of the local

beliefs and customs pertaining to the disposal of the mortal remains of loved ones. The same constraints are affecting cadaveric resources of Malaysia. Could the concerned authors outline in greater detail any efforts (or lack of the same) being taken for improving this condition?

- Prof. Fernando Benia (Uruguay) has pointed out that the body donation load is proportionate to the existing population of the area. In a country as large as India which hosts about 381 medical schools (government and private), many of which are located in rural areas; the disparity in the neighborhood population of each medical institution is considerable. Thus, while some institutions have surplus of cadaveric material, others might suffer a severe scarcity. This would be applicable to many institutions the world over. A minimum student-cadaver ratio can be worked on and a law enforced as to transportation (by appropriate means) of cadaveric material (beyond the desired/stipulated quantity) to the nearest institution which requires boosting its stock. This would ensure a more equitable distribution of this precious educational material. Malaysia is currently importing cadavers from Philippines, but apparently at great cost; our suggestion is a re-distribution of cadavers, wherever possible, within the same country.

- As described by Prof. Weiglein (Austria), an embalming process which yields 'as good as fresh' and pliable cadavers would enhance a student's dissection experience. Hence a request; the Graz Embalming Procedure ideally should be shared with the entire medical community.

- An interesting thought by Prof Weiglein; increasing the minimum age of the donor would decrease the cases of young suicides. Apparently, this thought is supported by actual observations. A psychiatrist might be the right person to comment upon this aspect of voluntary body donation.

- It is imperative to instil into the minds of incoming medical students the magnanimity of the donors without which learning of human anatomy would be restricted to texts and models. A "dedication service" as practiced in South Africa (University of Witwatersrand) should therefore be adopted as a universal essential in order to impress on the students the sanctity of a human body donated for the purpose of furthering education and research.

- Cleveland Clinic (USA) follows the system of prosection on fresh unembalmed bodies. The advantages are, no doubt, incredible. However, the difficulties involved in procurement of the fresh cadavers coinciding with the teaching sessions might be difficult for many institutions to

overcome. Further, could the author clarify the method of preserving the remaining portion of the cadaver (beyond the prosected part) and if this is not done, would it not result in too much of cadaveric wastage?

- Conversely, New Zealand stores its embalmed cadavers for 6 months prior to use. Though not mentioned, this would probably be a protective measure in case the body harbors any infection?
- Many countries (USA, South Africa) have indicated specificity as to the time the cadaver may be retained for purposes of teaching/research. In India, such a time frame does not exist.
- A decent burial/cremation for the post-dissected mortal remains, plaques erected in the dissecting room and organized memorial services as seem to be the norm in many (but not all) countries would help reassure an apprehensive prospective donor that his/her remains will be treated with respect and dignity.

**Prof. Jennifer McBride (U.S.A. –
Response to Garaud-Sharma)**

We have teaching sessions, research studies and clinical projects going on in the laboratory year round, so the availability of cadavers is not an issue. As we do not use any form of chemical preservation, all cadavers are placed in refrigeration units when not in use. In the event of increased donations, some cadavers may be frozen until needed. After dissection, a typical donation will last 4-6 weeks and then be placed in the freezer in preparation for transfer to the crematorium. With the variety of activities occurring in the lab, we are able to make full use of the donation.

**Prof. Subramaniam Krishnan (Malaysia –
Response to Garaud-Sharma)**

At the moment, we have some personal links with the Funeral Undertakers and we seek their support by paying an "additional fee" (which can be quite substantial), for the delivery of the unclaimed cadavers to our department. The legalities are strictly observed during disposal of the remains after some years as the prosected bodies gradually begin to deteriorate. As for the plastinated specimens, we keep have been holding onto them because of their durability but with the records properly maintained.

As for body donors, it has been status quo up to now. Import of bodies from Thailand and the Philippines is expensive and the cost has to be passed on to the consumers (read students and trainees). I recently gathered that even as late as

the sixties and seventies, medical students in several American Universities had to pay an obligatory US\$ 10,000 for the use of cadavers for dissection; this was in addition to the usual tuition fees. Can somebody verify if it is true?

In summary, cadavers can be made available for dissections/prosections or surgical training in Malaysia but at what cost? For our postgraduate training courses, cadavers have been imported and the costs are met in part by the trainees and the rest subsidised by the clinical departments, professional academies and surgical companies (having vested interests directly or indirectly).

**Prof. Jennifer McBride (U.S.A. –
Response to Krishnan)**

I have never heard, nor have my colleagues heard, of anyone having to pay a fee for the use of cadavers. I would be interested in receiving the resources where this person obtained this information.

Prof. Em. Don du Toit (South Africa)

The international authors consisting of eminent anatomists have stressed and addressed the role and responsibility of universities with medical schools, in the provision of satisfactory and essential infrastructure, with ongoing review by authorities, regarding human-anatomy teaching as a pivotal and unavoidable facet in medical-curricula and no possibility of down-regulation. World leading anatomists have emphasized from global experience, the relevance, directive and regulatory requirements, evidence-base, grade, medical-education ethic compliance, relevant to cadaver procurement and human cadaveric-dissection in undergraduate medical and dental-student anatomy teaching. Also the need for post-graduate specialties, as well as auxiliary health-care providers (nursing, occupational and physiotherapy and biokinetics) needing advanced and comprehensive anatomy training based on the use of human-tissue. This has been problematic in some medical schools where there is often an institutional disregard for the importance of anatomist-lecturers and relevance of cadaveric-based anatomy teaching in the dissection-hall, leading to intentional reduction in departmental resource-budgets.

Educators have fallen behind and ignore the fact that cadaveric-dissection and anatomy teaching is evidence-based, quantifiable and determines outcome quality of graduates. Teaching of gross human anatomy (macroscopic or systematic-

anatomy) has been dynamic and anatomy-teaching based on cadaveric dissection, for instance, has reverted back in the digital-era to instruction in regions, (as opposed to conventional systematic anatomy teaching) in the lecture-theatre and laboratory and regional-anatomy has become a central theme of the 40th edition of Gray's Anatomy after 150 years (1). This has radically changed thinking of anatomists and medical school curriculum reform. At the University of Stellenbosch, in South Africa, for the past 57-years medical students have been exposed to practical whole-body cadaveric dissection, with benefit, over six monthly integrated modules, extending over the first two years (2). During 2013 we reviewed a novel evidence-based audit, using several assessment parameters, regarding upper extremity human anatomy regional-teaching applying digital-imaging (Macroview-DM®), prosection and peer-mediated resources for occupational-therapy students. Basic, macroscopic-anatomy instruction in regions including relations, with profession-relevant clinical input, was provided in the dissection-laboratory. Modern evidence-based, adult-medicine teaching methodology shows that health-care professionals directing rehabilitation of patients to regain independence after injury or disease of the upper extremity, with underlying motor, sensory, and extremity dysfunction requires a comprehensive, evidenced-based and sound working-knowledge of regional, gross and applied-anatomy (pectoral-girdle, arm, forearm and hand). Our teaching hypotheses in this study, was that anatomy-demonstrator facilitated, hands-on-teaching by a professor, digital image enhancement of human cadaveric prosection, peer-teaching by table-assistance does not optimize gross-anatomy education and module-evaluation outcomes. As part of a standard anatomy-curriculum (supplemented with notes, internet-references, down-loads for mobile-devices, hand-outs, atlases, checks-and-balances) students received comprehensive, regional-based prosection-based morphological-learning (structure, function and relationships relevant to rehabilitation outcome), enhanced by professor directed digital-imaging (Macroview-DM® that gives 3D images) with big-screen projection in the dissection-hall, and assisted peer-mediated table-teaching. Measured outcomes were assessed after 22 hours of cumulative upper-extremity teaching in the anatomy-laboratory, professor-driven; osteology and histology inclusive. Outcome-review included 2.5 hour anatomy written-testing (including osteology and histology), practical-spotters, student-feedback by questionnaire (to assess content appropriateness, and module-scoring

from 1-3). Questionnaires and maximum student-feedback showed 81% favoured the integrated-course, regionally-based for an extremity, with guiding live professor-driven digital imaging magnification and peer-mediated table assistance with overall scoring of 60% (scores 2-3). Teaching and instruction by application of the cadaveric extremity regional-anatomy approach, mimics the way a rehabilitation health care worker delivers durable daily-care and rehabilitation. Clinically directed live-demonstrations, digital-imaging of prosections, together with peer-mediated teaching, small-discussion groups, offered added benefit in terms of examination-performance regarding upper-extremity and now lower-extremity practical's for occupational-therapy. This positive evidence-based audit of upper extremity anatomy teaching on a regional-basis, as described in the 40th Edition of Gray's Anatomy, enhanced with state-of-the-art digital-imaging driven at professorial level, and supplemented by simultaneous peer-mediated resources, emphasizes the importance and need for sustained and continued application of human cadaveric tissue, within protocol, in clinically-oriented anatomy departments.

Because of the inevitable, rapid development of and new technical treatment interventions and innovations in hospital practice and patient-care in the digital era (such as organ replacement, cardiac valvular interventions, endoscopy, cancer therapy, diagnostic-imaging and arthroplasty to address degenerative disease processes), satisfactory and sustainable training in anatomical sciences is needed and greater financial pressure on universities and medical schools will be forthcoming from industry, debate and public, to stay committed in providing optimal and upgraded teaching platforms. Better resource funding and increased financial budgets are imperative, to ensure optimal under and post-graduate anatomy training as part of medical curricula, inclusive of auxiliary medical-services such as occupational and physiotherapy.

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Dr Vidya S. Kharat (India)

A very interesting and informative article on 'Human bodies to teach Anatomy importance and procurement – Experience with cadaver

donation'. It was good to note the universal importance of cadaveric dissection except a few countries where there are difficulties in procuring the human bodies.

Being an anatomist from India, I have seen a drastic changing scenario from few unclaimed bodies to donated bodies, ungloved to gloved hands.

The number of donated bodies has increased as rightly stated by Dr. Namita Sharma (India). This increase is noted only in cities, but body donations are scarcely noticed in Indian villages. Myth's appearing in the media stating that a 'mutilated' body will come in the way of achieving salvation only acts as a deterrent for people willing to donate! Thus, the main obstacles are religious beliefs and taboos. Organ donation, although also on the increase in India is much lesser as compared to the developed nations.

Another important cause for the paucity of rural body donation could probably be lack of awareness. The awareness can definitely be created by the national eminent personalities on a national platform using media. Global programs can be launched which can increase the number of body donations not only in India but also throughout the world.

I found it very interesting to note the Graz embalming procedure which keeps the cadavers flexible and natural as patients during GA. (by Prof. Andreas H. Weiglein, Austria). My question to Prof. Andreas H. Weiglein (Austria) - I would like to know the details of the Graz embalming procedure because this technique could probably revolutionize the integrated teaching in medical education.

Very interesting was the debate put forward by Prof. Jennifer McBride (U.S.A.) about the technique of fresh tissue cadaveric prosections by residents. Students thus have a double benefit; learning the material from close peers who have had exposure to the clinical environment and, since this is being done on fresh tissue, it would simulate operating/ dissecting a live patient.

My question to Prof. Jennifer McBride (U.S.A.) - What is the time limit after receiving bodies that such fresh tissue prosected specimens can be prepared taking different weather conditions into consideration?. Further, any special precautions to be taken for the technique of fresh tissue cadaveric prosections?

**Prof. Jennifer McBride (U.S.A. –
Response to Kharat)**

The time limit for use of one fresh tissue body if stored in a proper refrigeration unit ranges from

6-8 weeks. However, this depends on how the donation is utilized for teaching and/or research. The clock starts ticking for one region of the donation once it has been exposed. For example, if an approach to thorax instruction follows a superficial to deep approach; that area of one specimen can be used for 2-3 different teaching sessions (i.e. thoracic wall, thoracic cavity, posterior thoracic wall). We will typically use one region for up to 2-3 weeks, then we move on to another region such as abdomen. The variability in time frame can be extended if one region is dissected at a time. Once a region is exposed its use is limited to 2-4 weeks.

Regarding precautionary measures, in addition to the testing procedures I mentioned in the previous article, we require that the students change into scrubs, wear gloves, protective eyewear and face masks. In addition, if desired, they can also wear shoe covers and bouffant or surgeon's caps.

**Christopher Redwood, Wesley Fisk
and Grant Townsend (Australia)**

We would like to add to the debate on human bodies to teach anatomy by providing some comments about the use of human bodies in teaching in Australia, in particular at the School of Dentistry at the University of Adelaide.

Cadavers in Australia are sourced primarily from voluntary body donation programs operated by licensed schools of anatomy usually located in medical schools. In most cases the donor has willed their body to science in writing many years prior to their death. After death, further next-of-kin consent is required. In South Australia, The School of Medical Sciences, The University of Adelaide operates a central mortuary facility on behalf of the State's Universities for the acceptance of bodies donated to science. It also controls the transfer of anatomical resources to licensed schools of anatomy within the State and Commonwealth in support of teaching, training, scientific studies and research.

Donors must meet strict acceptance criteria relating to the health and safety of both staff and students. Many programs in Australia serologically screen potential donors whilst others automatically exclude donors with any previous communicable diseases such as HIV, Hep A, B or C, TB, MRSA or VRE etc. The timeframe from death to donation is usually within 3 - 4 days. As donation is voluntary, donors come from almost all ethnic and socioeconomic backgrounds with the only limitation being on religious grounds.

Recently, with the increased demand for cadaveric anatomical resources for use in surgical training and research, a shortfall in supply has occurred across parts of Australia. To meet this demand some licensed facilities now source anatomical resources from whole body donor programs in the United States.

The Body Donation Programs in Australia place great importance on recognising the significant and often difficult decision families make in supporting their loved one's wish to donate their body for the advancement of science. In most cases, the Universities conduct annual memorial and dedication services for the families of the donors that are attended by the new cohort of anatomy students. Usually the use of a donated body will extend over a number of years, dependent on its use. When the remains are no longer required, licensed institutions offer either free University cremation, with the ashes returned to the next of kin, or free burial in a dedicated area within a chosen cemetery. Families also have the option to make their own private funeral arrangements should they wish, with the cost usually borne by the family in these instances.

The head and neck anatomy component of the Dental Science and Practice stream at the Adelaide School of Dentistry is presented in the second semester of the second year of the five-year BDS programme. Over a period of 12 weeks, students attend two weekly class meetings, each of one hour duration, participate in a one-hour tutorial, and spend one and a half hours in the dissection laboratory. A problem-based learning (PBL) model is used, with emphasis on scenario-based learning that requires considerable preparation by the students. To this end, the timetable has up to 10 hours per week available for self-directed or group learning and some of this time is expected to be used in the study of anatomy.

The course covers the gross anatomy of the head and neck, as well as neuroanatomy. All students are required to attend the dissection laboratory where they have access to a cadaver head for each group of six to seven students. Over the period of the course, each group of students dissects the superficial and deep structures of the head and neck, including the gross anatomy of the brain and intracranial structures. In addition, prosected specimens relevant to the topics covered, are available each week for examination. Students are supervised by experienced dental graduates and full-time staff from the anatomy department, and it is expected that staff members make clinically relevant observations to enhance the learning process.

While in class meetings and the dissection laboratory, students view videos of dissections and have access to computer software as well as standard texts and atlases. These aids are also made available for private study. The students also begin to practise the techniques of local anaesthesia when they are learning anatomy, and these aspects of the course are coordinated and integrated wherever possible. In the year following their anatomy course students attend a memorial service which includes families of body donors. This is an important opportunity for students to reflect on what a privilege they have had in being able to dissect the human body and to highlight the need for them to continue to develop their professionalism.

The act of dissection is considered fundamental to the understanding and learning of anatomy for several reasons. Primarily the ability to use tactile and visual senses allows students to get a complete understanding of the three-dimensional relationships so critical to understanding the tissues and structures that become daily targets of their clinical practice. Almost every clinical procedure a dentist undertakes involves manipulation or penetration of anatomical structures, and the understanding of spatial relationships is first observed by dissection. A good example of this is the size of the lingual nerve and its close proximity to the oral cavity which often comes as a surprise to dental students.

The process of dissection also involves far more than the acquisition of anatomical knowledge. It has a role in the development of professionalism; is a major shaper of attitudes such as respect, mortality, privilege and the requirement to share knowledge; and helps to shape caring and responsible practitioners who are reflective and show the attributes for effective self-assessment¹. The acquiring of professionalism by health practitioners is both an active and passive process. The qualities can be taught but there is also an absorption of the tacit behaviours observed in peers and tutors, which is shaped by the upbringing and values that are present in every individual based on their experience. It is known that the acquisition of professional behaviour by undergraduate students has several important requisite components. These are active teaching of the attributes, effective learning requiring reflection and group work, clinical relevance to allow students to feel they are part of the profession, and effective role modelling.

What an opportunity the role of dissection can play then in developing these skills. Not only is it the first exposure of a student to irreversible procedures on a human being, to be effective there must be good communication, group work, reflection both in and on action, an understanding

of the subject matter requiring preparation, and lastly a close interaction with and observation of a fellow professional. In addition it is a confrontational experience that may be the first encounter with a dead body for many students, which inevitably should expose them to mortality and other issues of the most fundamental nature. It is in fact a catalyst for maturation.

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Dr. Monika L. Piplani (India)

Cadaveric dissection in India is an important means of teaching anatomy and imparting knowledge to the undergraduates. Apart from medical students, the institute also has the students undertaking dentistry and nursing courses. Further the Department of Anatomy is also frequently approached by post-graduate students working in various clinical departments, for revising their concepts of anatomy as the same could not be fully ascertained while performing surgery. Even senior consultants, at times, have to visit anatomy department to update themselves with various approaches in order to overcome difficulties faced by them during surgery when a new operating technique is evolved. In super specialties like neurosurgery, urology, cardio-thoracic and vascular surgery, the role of anatomy cannot be under-estimated and it is fruitful for the post-doctoral candidates to refresh their memories by revising regional anatomy of allied subjects to acquire best operative skills.

It is an accepted principle of medical teaching that, as the students learn to recognize the clinical picture of a disease in a given patient, they will be able to retain better the clinical knowledge if they review the entire background of the presented problem.

Lack of individual attention to students during their academic session may be one of the causes of inadequate knowledge of gross anatomy. Snodgrass and McClure (1975) postulated that recognition memory seems to indicate that adult subjects in memory experiments will encode and store both pictorial and verbal codes to simple pictures whereas they do not naturally doubly encode words alone. They consider two memories encoding to be better than one. It is proved that learning process of the students is enhanced by having visual confirmatory stimuli to

assist the learning process in addition to verbal instructions by the teachers of gross anatomy.

Such review includes detailed examination of the anatomy of the parts involved. There are 150 students in first year MBBS and 10-12 students per cadaver are distributed. We use cadavers, anatomical models, pro-sections, dry bones, skeleton and interventional radiological techniques like MRI, CT scans and X-Rays. There is also an anatomy museum consisting of dissected specimens and models where the students visit any time after they finish the cadaveric dissection in the dissection hall.

Dissection of cadavers is said to be the most important and best method of learning gross anatomy throughout the world even today. Practical anatomy (dissection on cadavers) has been replaced by theoretical anatomy in some of the institutions due to non-availability of unclaimed or donated bodies. We usually get cadavers from donated or unclaimed bodies.

Practice of voluntary body donation is done at Government Medical College with a very simple protocol like a person who wishes to donate his or her body after death has to fill a form, get it signed by one of the family member who also acts as a witness and submit it to the concerned authority of the medical college. After the donors demise it is now relative's duty to inform the concerned authority. Sewa-samiti, Sahara group, is an organization involved in motivating the people for body donation. They organize camps or tell the group of people attending the bhog ceremony of the person who has donated his body, about the uses of donating bodies to a medical college.

In my opinion cadaveric dissection is the most important method of teaching the undergraduates as well as post graduates and consultants. Keeping in mind the effectiveness of the system of anatomy instruction, more and more people should be encouraged to donate their bodies after death so that medical science can flourish and serve the mankind.

Prof. Rafael Romero-Reverón (Venezuela)

I read the paper: *Human bodies to teach Anatomy: Importance and procurement - Experience with cadaver donation*. This debate with many medical schools around the world is really interesting. I want to answer adding my point of view about the Venezuelan situation in this matter

At the Department of Human Anatomy, José María Vargas Medical School, Faculty of

Medicine, Central University of Venezuela, the anatomists are also medical doctors with medical specializations like general surgery, obstetrician, trauma surgery and others. The Anatomy theoretical lessons are given using multimedia power-point program, while practical lessons consist of dissection of formaldehyde fixed cadavers. It is also used dry bones, plastic models, videos, e-learning resources like online atlases and video-dissections and complementary diagnose image as MRI, CT Scan, X Ray plaques. These tools are included as supplementary material. However, we know these materials are important additional resources, but they are not considered sufficient to replace the experience of manipulating or dissecting anatomical specimens.

Anatomical dissection and preparations are still considered in Venezuelan Medical School the best way to visualize topographical landmarks and anatomical variation, because they allow the students to establish relationships between different organs and structures.

The Vargas Medical School accommodates about 200 medical students per year. Gross Anatomy course is taught during the first year and Neuroanatomy during the second year of the career.

Within the medical programs, full body dissection is included as part of the integrated curricula. The dissections take place in groups of about 15 to 18 students per table (and cadaver). Medical students attend their anatomical laboratory course two days a week; however, the cadaver is accessible to medical students five days at week. The cadavers are stored for more than 6 months prior to use.

Instead of the above mentioned cadaveric-based teaching/learning, most of the Anatomy departments in Venezuela are actually receiving a reduced group of cadavers, usually insufficient to guarantee an adequate learning. This fact obviously causes a great delay to research. At the present, Vargas Medical School receives 4 to 5 cadavers per year: most of them are self donation bodies; very few of them are unclaimed bodies. We do not have enough cadavers, which made the cadaver-student ratio to be low. There are 12 medical schools in Venezuela and the access to cadavers is practically the same in all of them. Methodology used in anatomical teaching also varies from one to another Venezuelan medical school. Most of the medical schools ask students to dissect human cadaver or to examine prosections, both, as a part of their anatomical laboratory course. The study of human cadaver is considered particularly useful. It can be supplemented but never replaced by other means.

In Venezuela the process to donating bodies is simple and largely cumbersome. A person who desires to donate his body after death needs to fill a form, get it signed for two witnesses and submit it to the medical school to which the cadaver is donated. Donors require being, at least, 18 years old at the time of registration. The donor must have intact mental capacity when signing the donation will. Subsequent to the donor demise, the relatives need to be proactive in fulfilling the wishes of the donor. However, in cases the relatives decide, not to donate the body of their kin, for sentimental or other reasons, the medical school which was to receive the body cannot persist on the delivery of the same. There is not other legal way to obtain cadaver for anatomical study. Donations are not accepted if there has been some severe trauma to the body, an infectious disease like hepatitis, HIV/AIDS or other severe documented infection. Venezuelan laws state that every citizens, after his dead is a potential donor of organs for transplantation, unless there is an explicit negative to do it. The law do not state cadaveric donation for anatomical study.

However none of the Venezuelan medical schools has an active program for catching potential donors. There is no national program for donation and reception of cadaveric bodies for medical education or research. It is therefore imperative to create a working system for body donation for medical education in Venezuela. The use of cadavers is the cornerstone of Human Anatomy teaching in Venezuela. Teachers at Vargas Medical School have always kept in mind that it is important for the students to be able to watch the continuity, the relationships, and the 3-dimensionality of the structures of the human body. Therefore we consider the cadaver, by far, the best model to provide this knowledge.

Guenevere Rae (U.S.A.)

This debate expands upon recent discussions of whether it is necessary to use cadavers and dissection in medical education (Evans and Watt, 2005; Gunderman and Wilson, 2005; McLachlan and Patten, 2006; Turney, 2007; Sugand et al, 2010; Plaisant et al, 2011). Although it is well documented that dissection of cadavers is an effective way to teach anatomy (Johnson, 2002; Evans and Watt, 2005; Gunderman and Wilson, 2005; Sugand et al, 2010), the cost and resource demand of cadaveric dissection has prodded some academic institutions to use alternative materials (McLachlan and Patten, 2006; Anyanwu et al, 2011; Collins, 2008). The

participants of this debate add further support to past reports that the majority of medical institutions use cadaveric dissection as a primary teaching method (Drake et al, 2009). In addition to citations addressing the necessity of cadavers to teach anatomy, headway has also been made to highlight regional differences in procurement or use of whole body donations (Bolt et al, 2010; Anyanwu et al, 2011; Cornwall et al, 2012; Halou et al, 2013). These differences do impact the weight that cadaveric dissection carries in an individual medical institution, as mentioned by Prof. Susana N. Biasutto of Argentina, Prof. Subramaniam Krishnan of Malaysia, Prof. Luis E. Ballesteros of Colombia, and Ogueri Duru and Prof. Oldapo A Ashiru of Nigeria (Biasutto et al, 2014).

It has been suggested that cadaveric dissection teaches more than just anatomy. The gross anatomy experience may create a double image of the body in the eyes of the medical student (Segal, 1988). The body is seen as an item that needs to be routinely managed by professionals, and also an item that manages other bodies. Prakash, et al (2007) suggests that cadavers are teachers of the medical student and they view the anatomic gift as one of knowledge. They also suggest that the bond that the student makes with his/her cadaver is a relationship much akin to the doctor and patient. These more reflective advantages to cadaveric dissection make it a superior teaching tool for future practitioners. The form and function of the human body can be learned from books, medical imaging and virtual dissection. However, the psychological benefit that a medical student receives from this intimate interaction should not be understated, even though citations on its existence are scarce.

To expand on the debate surrounding cadaver use in anatomy education, it is important to explore whether we live up to the donor's expectation through our use of their gift. The highest motivating factors behind the potential donor's act of bequeathing his/her body are: they want their body to be useful after death; they want to aid medical science; they want their bodies to be used for mankind's benefit (Bolt et al, 2010, 2011, 2012; Cornwall et al, 2012; Rokade and Gaikawad, 2012; Halou et al, 2013). In essence, these are the body donors' expectations: To aid medical science and be "useful". Presumably, they would have wanted to be used to the fullest extent. Anatomic variation of cadavers provides a source of enriched learning opportunities within medical education (Prakash et al, 2007; Bolt et al, 2012). However, in teaching anatomy, do we utilize the individuality of the cadaver to its fullest extent? Do we highlight and utilize abnormalities and diseases

found during dissection to the degree that the body donor probably expected us to?

Gross anatomy courses usually focus on normal anatomy. If the most common reason that an individual gives him/herself is to progress the field of medicine by using their body as a learning opportunity, then are we falling short of this goal by leaving out the pathologic anatomy? Although there are a few recent reports of gross anatomy laboratories that utilize pathology as integrative learning opportunities (AlSaggaf et al, 2010; Alyafi et al, 2012; Eisenstein et al, 2014), this is far from standard practice. If we strive to meet the expectations of the person who gave the anatomic gift, it should be our mission to identify wasted learning opportunities that can be utilized during cadaveric dissection. From use of these opportunities, we will come closer to realizing the true educational value of the anatomic gift.

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Dr. David Kachlik (Czech Republic)

The education of medicine and anatomy in the Czech Republic is based on a tradition derived from the old German and Austrian medical curricula. There are eight faculties at four universities in the Czech Republic teaching the full medical curriculum (four of them the dentistry curriculum) and several more teaching the bachelor studies (nursing, physiotherapy, radiotherapeutic lab-assistants, paramedics, public health, etc.). The oldest faculty was founded in 1348 (Charles University in Prague), the youngest is only four years old (University Ostrava). All faculties use the traditional curriculum of anatomy

as an individual subject taught in a way of systematic and topographic anatomy. The only exception is the Third Faculty of Medicine, Charles University in Prague, which has introduced in 1996 a curriculum based on principles of integrated and problem-oriented instruction and early contacts with patients. There are approximately 3.500 medical students and 150 dentistry students in the anatomy curriculum. The anatomy is taught in the first year (and second year) as two (or three) semester-long subject. In third or fourth year there are either mandatory or optional courses of topographic anatomy. All eight faculties consider the dissection of real cadavers to be a basic and inevitable part of the anatomy education of undergraduate students. The hands-on dissection courses are held as one or two week periods, concerning the dissection of limbs and the full body (with slight differences among the faculties). Moreover is the dissected material used also during the practical classes throughout the whole year. Evidently, other types of supporting material are used during the education (plastinated specimens and slices, plastic models, imaging methods, such as CT, MRI, X-ray, ultrasound, nuclear medicine, videos from endoscopic approaches, on-line modules etc.), but the dissection stays as the principal and inevitable part of the face-to-face teaching process. One of the advantages is that the most of the dry and wet specimens are accessible to students throughout the whole day on all weekdays.

The postgraduate students of surgical fields (general surgery, orthopedics, urology, gynecology and urogynecology, otorhinolaryngology, vascular surgery and neurosurgery) as well as of the urgent medicine also use the facilities of the medical faculties and their dissection halls not only for demonstrative topographic dissections but mainly for the hands-on courses when the young physicians can practice both the basic and advanced surgical techniques.

The method of embalming are both traditional (conservative solutions of different ratio of formaldehyde, glycerin, alcohol and acetone for injection), used mainly for undergraduate students and innovative (Thiel's method) for the postgraduate ones. The conservation time is usually 10-12 month prior to use. Minority of departments uses also the fresh frozen cadavers for the postgraduate courses only.

The source of the bodies for the anatomical dissection and postgraduate courses is based purely on the donation program. There is a law concerning the usage of the body of the deceased which strictly allows using only bodies of donors who have signed a written consent

before their death. This law is different from that concerning the transplantation of organs – every citizen of the Czech Republic is considered as a potential donor of organs for transplantation unless she/he expressed actively his negative attitude.

The process of donation is very simple but not unified throughout the whole country, although the Czech Republic has only about 10.000.000 inhabitants. There exists no national program concerning the body donations or a database of potential donors. Usually, a person who desires to donate her/his body, has to come to the department of anatomy to fill and sign a form and then is the donor put in the register. There is neither financial reward nor demanded fee for the donation. There is also no upper age limit for the donors, the lower limit corresponds to the age of 18 (full age according to the law). Nowadays, 100% of bodies received for the dissection, come from the active donors. No abandoned or unclaimed bodies are (and may not be) used during both the educational and scientific process. The relatives have no right to claim the body of a donor but if they do, each such case is treated individually to meet the requirements of both sides and to solve the situation with honor and fairness.

The promotion of the bequest or donation of the body for the scientific and educational purposes is performed in public rarely. From time to time an article in the newspaper is issued but the overall awareness of this concept is rather low in the population.

There is possibility to refuse the body from several reasons: technical (too long distance for transport - all the expanses concerning the transport and future cremation and funeral arrangements are covered by the department of anatomy; full facility to store the body) and medical (infectious disease, such as HIV infection, hepatitis B, C, D, tuberculosis and Creutzfeldt–Jakob's disease, morbid obesity or dismembering / mutilating injury, performed autopsy, organ donation for transplantation and other). The problem faced in many donors is sometimes a total lack of medical history (except the cause of death) and that is why some of the dissected bodies can feature a rather surprising state of pathological change inside.

The body usually stays in the department for 2-5 years. After the dissection are the remains (or the whole body) cremated and the ashes are handled according to the wish of the donor, i.e. either returned to the relatives, interred in the columbarium, buried in the urn garden or scattered at the special cemetery green plot. Each year, a religious service or non-religious ceremony is held (differing depending on the departments) to

pay tribute to the selfless donors and to give a possibility to give the last farewell by the relatives.

The gravest problem faced by the departments are the expenses for the transport and funeral arrangements which can limit the acceptance of donors more than the lack of space to store the bodies or lack of the donors willing to bequest their bodies.

Viewed from the future perspective, a common donation program should be developed in the European community and the corresponding law standards should be unified to balance the disequilibrium and provide sufficient number of bodies for regions with demand (e.g. Italy).

Generally speaking, the principle of the observation of the three-dimensional arrangement of the body, “plunging” into the real body, feeling the real tissue, meeting the real dimensions and proportions, learning topographical landmarks and seeing the interindividual differences and matching the variations is the greatest contribution of anatomy (and of the dissection of embalmed cadavers) to the knowledge of the medical student.

Dr. Cagatay Barut (Turkey)

“Doctors without anatomy are similar to moles: they work in the dark and their daily tasks are mole hills“. Friedrich Tiedemann

As stated by famous German anatomist and physiologist Friedrich Tiedemann anatomy is the keystone of medicine. Thus anatomy is the one of the most important subjects studied by medical students when they start their medical career (Rajkumari and Singh, 2007). Despite the advance of the digital technologies and bio-informatics direct contact with tissues and anatomical elements cannot be replaced (Aziz et al, 2002; Biasutto et al, 2006). The use of human cadavers as a learning tool has been in practice for over five hundred years (Izunya et al, 2010). Active observation and participation in cadaveric dissection helps the understanding of three-dimensional structures (Javadnia et al, 2006; Lachman and Pawlina, 2006). Other than anatomy education, proximity to the cadaver is also fundamental for a humanistic education, as it provides students with the opportunity to learn to respect the human being and the vulnerability of life, perceive and reflect on human limitations, and deal with the concept of human mortality (Sendemir, 2014).

According to Council of Higher Education records there were 21 medical schools dealing with medical education in 1986-87 while the number

of medical schools increased to 74 in 2010 in Turkey. Thirteen of those medical schools were not active in that time. Medical intake was 7.536 and the total number of medical students was 35.781 in 2010. Besides medical students, student intake to dentistry, nursery and allied health sciences was 5.524. The total number of cadavers that were used for medical education was 188. In that time 9 of the medical schools had no cadavers (Solak et al, 2010).

In February 2014 the total number of medical schools was 86. Eight of those medical schools were not active. Medical intake was 9.423 and the total number of medical students was 51.445 in 2010. Besides medical students, student intake to dentistry, nursery and allied health sciences was 12.415. The total number of cadavers that were used for medical education was 318. In that time 21 of the medical schools had no cadavers (Solak, 2014).

Despite the increase in the number of medical schools and medical students the increase in the number of cadavers is far from enough in Turkey. Although there seems to be an increase in the number of cadavers, the number of students per cadaver is not acceptable for proper medical education. This reflects limited cadaver availability. Furthermore the stay of cadavers in the labs extends although their conservation status and academic utility are not ideal. The cadaver can stay more than one year in the lab in some instances. Besides cadavers, commercial anatomical models and plastinated materials are also used for anatomy education.

There is legislation stating that unclaimed bodies can be provided to the medical schools in case they are not related with any forensic issues. Such bodies should be stored for 6 months prior to use. There is also legislation permitting the living individuals to donate their bodies for educational and scientific purposes. Depending on this in order to donate one's body the individual needs to fill in a form, get it signed by two witnesses and a doctor working for a medical school. But final decision depends on the relatives of the donor. In case the relatives so desire not to donate the body of their loved one, the medical school which was to receive the body can not insist on the delivery of the same. Furthermore with a new legislation which was effectuated in January 2nd, 2014 it is possible to import cadavers/cadaveric materials fulfilling the requirements from other countries for educational purposes.

The major source of cadavers has been unclaimed bodies from mental and state hospitals for a long time (Sehirli et al, 2004; Seker et al, 2013). However there is another fact that the municipalities are in charge of any unclaimed

body for burial. Thus many of the unclaimed bodies do not reach to medical schools. Despite the legislation about body donation it was not successful as Turkey has a different cultural and religious background compared to the Western world (Sehirli et al, 2004). There is not a national or local program for body donation for university teaching and research. Even the High Board of Religious Affairs declared positive comment on organ transplantation and body donation was appropriate to Islam there have not been enough body donations in Turkey to date. In addition, anatomical parts or remaining parts of the corpses from legal autopsies performed by the Council of Forensic Medicine had been received for some time, but this source could not be a proper source as the public prosecutors refused to send the bodies to medical schools. After the legislation permitting to cadaver import several medical schools imported cadavers during 2014, some of the medical schools obtained commercial plastinated bodies for anatomy education. Due to the need for high budgets t cadaver import is as expensive way to obtain bodies.

In a study investigating the opinions of anatomy instructors on cadaver and utilization of cadaver in anatomy teaching it was revealed that cadavers are valuable and respectable and have humanistic and educational importance. In that study it was also stated that cadaveric studies may be considered as a facility of learning human anatomy and also gaining physician for medical students (Ogenler et al, 2014). However the attitude of Turkish anatomists toward body donation is interesting. In the study of Sehirli et al (2004) the majority (95.2%) of the respondents stated that there was an insufficiency of cadaver for anatomy education. The recommended solutions were to increase the supply of unclaimed bodies (77.1%) and to increase body donation (78.3%). 24.1% of the respondents in that study stated that although body donation was a good solution proposal for cadaver insufficiency it was almost impossible to realize it in Turkey. It was believed that a campaign could be effective in increasing body donation (83.1%), but only half of the respondents were willing to participate in such a campaign. In that study none of the respondents had decided to donate their bodies for dissection. Only 15.7% of them stated that they may donate their bodies. Thus there is a conflict between unwillingness to donate the bodies of anatomists and encouraging people to donate their bodies (Sehirli et al, 2004). In another study investigating the opinions of Turkish university students on organ donation and whole body donation in anatomy education 85.4% of the participants stated that cadaver

dissection aids the medical students to upgrade their knowledge on medical science. It was interesting that although 71.5% of students said "yes" to the statement "I would like to be useful after death", 59.5% of them do not want their body to be used as teaching or experimental material. One more interesting issue revealed in that study was as follows: 78.1% of the students were willing for being organ donors. However of the ones who had accepted to donate their organs 73.3% refused to donate their bodies (Oktem et al, 2014).

Thus the thought of being dissected is not easily accepted even by anatomists and medical students in Turkey.

The body donations of public figures and opinion leaders are suggested to help to constitute positive examples for the population and increase the number of body donations. To give publicity such attempts through press and media may positively affect the attitudes of the individuals. World famous conductor Hikmek Simsek who died in 2001 donated his body for anatomy education and this constituted an example for the public and positively affected body donations that time (11, 14). The announcement of well known neurosurgeon Prof. Gazi Yasargil indicating that he donated his body for anatomy education was also a positive contribution (Gurbuz et al, 2004; Seker et al, 2013). One more example of such body donation was made by Prof. Yakup Tuna who is the chair of Department of Anatomy, Cerrahpasa Medical Faculty - Istanbul University in 2012. An interview about his donation was published in a national newspaper.

Turkish Society of Anatomy and Clinic Anatomy is also working on how to obtain sufficient number of cadavers for medical education. The executive committee of the society started to organize "National Anatomy Week" since 2012 and declares official opinion of Turkish anatomists during the preparation period of legislations to authorities (Seker et al, 2013).

Prof. Radik M Khayrullin (Russia)

The Russian experience of using cadavers in the educational process and in the scientific research has some of its own specific features that distinguish it from the practices of other countries. Firstly, the process of donation of the whole body (as donations), in contrast to the procedure of individual donations of organs and cells, in Russia does not exist and never existed. In absence of a legal framework, the conscious will of a man to donate his body before death or the allowance to the close relatives to donate

after death is the procedure of body donation for the medical education or the scientific research. It is not prohibited by law, but also is not officially regulated. However, in the history of Russian anatomy of 19-20 centuries there were several cases of wills, by ordinary people, donating their bodies only for the anatomical museums, followed by the real embodiment of their will. Posthumous exhibition of these bodies are well preserved and are the adornment of some educational museums of human anatomy departments of medical universities so far.

The individual donation of organs and cells, including the posthumous (i.e. conscious donation) and the donation with the permission of relatives in Russia with the legal registration of necessary documents is regulated by a special federal law "About the transplantation of organs and (or) tissues in the Russian Federation" 4180-I (22/12/1992). According to the law, the donation of organs and (or) tissues, in Russia cannot be the object of traded. However, the law expressly states that the donation of organs and cells for other purposes, i.e. use in the educational process for dissection, is not involved. In other words, the donation of the cadaveric material (but not the whole cadaver) in Russia is used out solely for the purpose of transplantation.

However, it would be quite wrong to end at this point and close the discussion. In Russia, at least for the past 300 years, teaching of the human anatomy at medical universities is unthinkable without an autopsy and body dissection. Moreover, dead corpses are available for dissection in medical universities in the meantime until official documents are issued. In our days, educational standards approved by the Ministry of Education and Science of the Russian Federation provide for the mandatory presence of three conditions that are relevant to obtain a license to conduct educational activities in the field of medical education. Any medical university should have an anatomical museum (1), morgue (2) and anatomical (i.e. prosection) halls (3) with the necessary equipment. The university is not approved and licensed by the Ministry until these structures are functioning.

The first document which regulated the delivery of corpses to medical universities for education and scientific purpose was accepted in 1934. It was a special bylaw of the soviet Ministry of Health about the structure and the work of the bureau for forensic medical examination. Since then the procedure of the delivery of cadavers to medical universities and scientific institutes in Russia is regulated only at the level of Federal Government. In recent years, upon the transition of the country from old social and economic model of development of the state to the new

model, this system of delivery of cadavers to medical universities strongly suffered. This change has led to the fact that, since 1991, even in the leading medical universities the quantity of cadavers and cadaveric material in anatomic departments strongly decreased. Unfortunately, it did not promoted any improvement in the training process for Russian medical students.

Due by the efforts of the professional anatomic community and involvement of the public in essential problems of medical education, this problem was solved. In 2012 (21/07/12) it was approved the special Resolution of the Government of the Russian Federation N 750 "About the approval of Rules to transfer unclaimed bodies, organs and tissues of the deceased people to be use for medical, scientific and educational purposes, and also for other specified purposes". The specified rules regulated the relations which connected pathological prosection, forensic medical examination of a corpse and also body and tissues donation and their transplantation. According to rules, transfer of an unclaimed body of a deceased person, whose identity is not known, is not allowed. It is determined that the unclaimed body, organs and tissues of the deceased person "can be transferred for medical, scientific and educational purposes to the educational organizations, which realize basic programs of the secondary school, the higher and postgraduate medical or pharmaceutical education and the program of additional professional education, to scientific organizations, and also to medical organizations".

Two indispensable conditions regulate this procedure. Firstly, it is the written request of the receiving organization. Secondly, it is the written permission of the organization, which appointed the forensic medical examination of an unclaimed body. Thus, the initiative for receiving enough cadaveric material is entrusted only to the department of anatomy of the medical university and its chair. The same conditions regulate the receiving of embryonic and fetal material and cadavers of newborns and children.

Our own experience with the use of cadavers and organs of unclaimed bodies showed pathological departments and morgues of hospitals and other medical institutions, hospices, bureau of forensic medicine (mainly) and hospitals of penal institutions as sources. For 25 years of our work we had only one conflict situation, the claiming back of a corpse was initiated by a close relative

and it was not met. The term of "use" of a body lasts 10 years; this condition is regulated by the rules stated above. After use the corpse with obligatory documentary registration will be buried as an ordinary person. The documents proving his identity are stored during the usage time at the department of human anatomy, and then are transferred to the funeral office.

There are always religious and ethical problems and it is necessary to tell some words about it. If the religion of the unclaimed person was known and (or) its national identity, as a rule, the execution of all necessary religious procedures are entrusted to funeral office. From the point of view of the general human and civil laws, first of all widely discussed in the press and the legal environment of "the somatic right of human", according the existing legislation in Russia it is generally accepted the practice of posthumous consent to use a body "without asking, i.e. of hush", that is the practice of consent "a priori".

It caused and causes fair criticism of civil and legal society, leads to insoluble contradictions in law-enforcement practice and is ambiguously perceived by the environment of teachers and students. It is still necessary to work on this topic. As showed by the last analysis in the practice of 13 years (2000-2012) of the donation of organs for transplantation (including organs withdrawn from cadavers) in 48 countries with "opt-in" and "opt-out" consent systems, not always attempts of legal declaring of "the somatic right" lead to the expected results [1]. In certain cases it leads to the sharp reduction of the supply of the cadaveric material for corresponding purposes and to the growth of the negative attitude of the society.

In conclusion it should be noted that our opinion provides basic principles for body and organ donation for medical training and scientific research which should be regulated at the level of the World Health Organization or inter-governmental agreements in which ethical, legal and psychological aspects of this problem have to find reflection. The professional society of anatomists, lawyers, doctors and representatives of the general public of all countries have to take part in the development of these principles.

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