

Transplant Anaesthesia

Solid organ transplants are slowly increasing across the world. As the societies evolve and communities begin to realize the value of organ donation after brain death, the number of donations after brain death will continue to rise. These numbers, however, encouraging are far inadequate to meet the demands from the ever-growing number of recipients. This gap is filled in some measure by live donors who are subjected to an invasive procedure to provide kidneys, part of the liver, or even lung. In comparison, the patients with end-stage heart disease have no such options and continue their vigil on the waiting list. This has also led to a huge increase in the number of implantable devices like the left ventricular assist device in developing countries in recent times.

The Anaesthesiologist and the Brain-dead Donor

Brain death or brain stem death is the state of irreversible brain damage which follows a significant injury to the brain. Various societies have formulated their guidelines outlining the diagnosis and management of the brain-dead patient [1]. Once confounding factors such as hypothermia, anaesthesia drugs are ruled out, a set of clinical tests are performed to determine loss of cranial nerve function and absolute absence of any respiratory efforts. These tests are repeated after 6 hours before the patient is certified as brain dead. An anaesthesiologist may be part of the team certifying brain death along with

other approved team member specialists such as the intensivist and the neurologist. The apnea test is the main test and is conducted with care and precision as significant hypoxia, acidosis, hypotension, and arrhythmias in an inadequately prepared patient is not uncommon. The patient is officially declared dead at the end of the second successful apnea test where the arterial carbon dioxide goes above 60 mmHg (or 20 mmHg over the baseline in chronic obstructive pulmonary disease patients). It should be noted that tests for certification of brain “stem” death are clinical and ancillary tests such as radiological tests are rarely needed. An electroencephalogram is the only additional device needed in countries where the “whole”-brain death concept is followed with all the other clinical tests being identical. Only once in a while will an anaesthesiologist be called upon to care for a brain-dead organ donor. This rare occasion also provides an immense opportunity for the anaesthetist to make a positive difference in the outcome of multiple recipients suffering from severe and irreversible end-organ disease. Published reviews outlining the intraoperative management of the brain-dead donor abound [2]. The intraoperative management is basically a continuation of the supportive care provided in the ICU. The operation theater becomes the virtual “ground zero” where harvest teams from wide geographical distances converge on at odd hours. The local anaesthesiologist

assessment includes a routine clinical check and the biochemical workup, especially the electrolytes and other tests reflecting the individual organ function. It is mandatory to confirm the completeness of the documentation of brain death. The transport to the operation theater should be preceded by emptying the stomach, an oral and endotracheal suction, ensuring that all the invasive monitoring lines are fixed well, and reflecting adequate pressures. An antibiotic dose is administered based on the institutional protocol or on the basis of the sensitivity reports. The vasopressor agents and other supports provided as infusions should be diligently continued during the transport and beyond. The anaesthesiologist should be aware of the organs that would be harvested so as to plan an effective fluid strategy (as contradictory goals may be present, for instance, in lung and kidney harvest) and anticipate the surgical steps. An opioid and long-acting muscle relaxant are administered to counter the reflex sympathetic response and to prevent reflex muscle movements due to intact spinal arc or brain death-associated automatism. An optimal mean arterial pressure above 65 mmHg is targeted and a CVP of under 8 mmHg is usually preferred. An adequate urine output, a near normal pH and electrolytes with steps to counter the metabolic acidosis, and temperature maintenance are desirable. The vasoactive supports including vasopressin for countering the diabetes insipidus are titrated to fine tune the hemodynamics till the very end of the surgery when IV heparin 300 IU/Kg is administered and followed within minutes by aortic clamping and administration of the cold preservative solutions. Due to the shortage of donor organs and the ever-increasing number of recipients in need of life-saving organs, the donor criteria are expanded to

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has a big role in facilitating the coordination among these groups. Pre-operative

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include brain-dead donors who are deemed to be suboptimal at the time of initial assessment but with aggressive protocolized care provide organs which have demonstrated excellent short- and long-term outcomes. Similarly, donation after cardiac death is increasing and showing encouraging organ outcome in the recipients. Donor care is ever evolving and individual protocols concerning aggressive management of the “catecholamine crisis,” need for a hormonal resuscitation protocol and time spent to optimize donor to increase the organ quality and yield are areas of ongoing research as is the concept of ex vivo perfusion systems to care for organs enabling a safe increase in the allowable ischemic time as well as the option of observing borderline organs for reversible injury and viability [3, 4].

Anaesthesiologist and the Recipient

Anaesthesiologists caring for transplant recipients are slowly evolving into “transplant anaesthesiologists.” In most centers not catering to the transplant procedures regularly, the general anaesthesiologists don the mantle whenever required. Cardiac transplants are catered to by cardiac anaesthesiologists and due to their regular interactions with the same discipline find themselves in a better position during cardiac transplants than general anaesthesiologists conducting anaesthesia for the occasional solid organ transplant. Familiarity with the disease process is absolutely essential and anaesthetists would do well to understand the various pathologies, leading the end-organ dysfunction. Each organ system has its own set of symptoms and outcomes, severity grading criteria or scores, optimizing strategies, and listing protocols. A well-designed evaluation which details the past and current clinical situation, trends in the investigations, severity of complications, or worsening as a natural course of disease (subacute bacterial peritonitis or hepatic encephalopathy, pulmonary hypertension in liver dysfunction, the efficiency of dialysis in

a prospective renal recipient, or the presence of Stage D failure in cardiac patients) is critical information. An open communication should be established with the surgical transplant team as the clinical situation is forever changing and should be constantly reviewed. Most of these patients are exquisitely balanced and other organ systems also face the brunt of the primary disease. A proper anesthesia plan and clinical care pathway should be formulated and discussed aloud in the multi disciplinary meetings along with other surgical and medical concerns. In case, the patient is waiting for organs from a brain-dead donor, most of the organs arrive without warning and seldom is there enough time to carry out these engagements. A thorough clinical examination, laboratory, and radiological workup including assessment of vascular access sites must be performed at the time of initial assessment. These are vital for planning and also to detect potential contraindications such as active infections, malignancies, significant cardiac and pulmonary comorbidities, psychiatric illness, possibility of non-adherence to the strict post-transplant immuno suppressant therapy, and hidden endocrine disease. This is also a great opportunity to develop a rapport with a sick patient whose post-transplant care will be enhanced by interactions and involvement of the anaesthesiologist. Diabetes remains the most dreaded menace due to its multisystemic involvement including microangiopathy, neuropathy, nephropathy, peripheral vascular, and cardiac disease. Incidence of pancreas transplant simultaneous with renal transplants in diabetic nephropathy is on the rise necessitating a much stricter glycemic monitoring during the transplant. The anaesthesiologist must possess a working knowledge of immuno suppressants and the administration of “induction” doses of drugs such as Basiliximab may be a routine practice in some centers. Infection is a major concern in all transplants and every measure should be implemented to keep

the menace at bay. The transplanted organs are devoid of autoregulatory phenomenon as well as neural innervation and control and present its unique challenges while dealing with organs such as the heart. Ischemic reperfusion injury is an unavoidable entity. The anaesthesiologist along with the surgical team should build organ-specific strategies. Common for all transplants would be to cryopreserve the harvested organs well, minimize the ischemic time, ensure excellent anastomosis, good glycemic control, and optimal perfusion pressures at unclamping. Other measures like a well-timed administration of mannitol during renal transplant or methodical monitoring and management of “reperfusion syndrome” in liver transplant along with a close communication with the surgeon are valuable. Judicious use of the available intravenous fluids and blood along with vasopressors, inotropes, and inodilators is invaluable in tidying over hemodynamic perturbations as well as crisis situations during a transplant. Transplant anaesthesia and care of the brain dead are intricately interwoven with a host of issues - ethical and clinical and a robust multi disciplinary approach will be necessary to ensure a positive outcome in this challenging yet fulfilling patient group.

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