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TRALI: THE #1 KILLER AMONG TRANSFUSION OF BLOOD PRODUCTS

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Presently, the three most common causes of blood transfusion related fatalities in the US are bacterial contamination-14%, ABO Hemolytic reactions (misidentification of patients or blood product) - 14.3%, and **Transfusion Related Acute Lung Injury (TRALI) -16%**. As the number 1 killer among recipients of transfusion of blood products, greater awareness is crucial to be attentive for signs and symptoms of TRALI.

TRALI is an under reported, serious, often misdiagnosed and potentially fatal complication of transfusion therapy, characterized by non-cardiogenic acute pulmonary edema **temporally related to all plasma containing blood products** including whole blood, packed red cells, platelets, cryoprecipitate, fresh frozen plasma and rarely IVIG. According to current estimates, plasma-rich products cause perhaps 1,000 severe TRALI reactions per year, including 100-200 deaths. Despite the increasing recognition that TRALI represents an important clinical syndrome and one of the biggest challenges of the transfusion medicine, much about the pathogenesis, treatment and prevention of TRALI is poorly understood or is controversial.

Several **mechanisms of pathogenesis** have been proposed, including alveolar damage by granulocytes activated by leukoagglutinating antibodies or by biologically active lipids within the transfused components. Leukoagglutinating antibodies with recipient-type anti-HLA class-I or anti-neutrophil specificity are strongly associated with TRALI. These antibodies are frequently found in plasma from multiparous women and people who have received previous transfusions. TRALI, therefore, may be preventable by avoiding the use of components from multiparous women and people with previous transfusions; or by developing screening tests for these antibodies.

Clinical features of TRALI include rapid onset of respiratory distress, fever (1-2 °C increase), hypoxia, non-cardiogenic pulmonary edema, and bilateral pulmonary infiltrates during or soon after blood transfusion, typically within 1-6 hours of transfusion. As little as 10 mL but most typically over 50 mL of transfused products will trigger the reaction. Increased risks of reaction are associated with surgery, trauma, sepsis and massive transfusion.

Major differential diagnoses include Febrile Non Hemolytic Transfusion Reactions (FNHTR) and volume overload. The severe form of TRALI also mimics ARDS. Treatment is supportive, and should be guided by the same principles used with patients with ARDS.

Be alert that any respiratory distress occurring during or following blood or blood component(s) transfusion could potentially be TRALI. As with any adverse or suspected transfusion-related complication, transfusion should be stopped and followed by oxygen and supportive therapy, if applicable. The Blood Bank should be notified promptly.

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INTRAOPERATIVE CONSULTATION (FROZEN SECTION) TURNAROUND TIME

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In the most recent Anatomic Pathology Customer Service Survey, the most common customer (physician) comments or complaints relate to the issue of intraoperative consultation (frozen section) turnaround time for surgical specimens. Concern was expressed by a small minority of our clinician customers and is an issue that we feel the need to address to the satisfaction of all our valued customers.

Intraoperative consultations are sought by surgeons for a variety of reasons, including assessment for potential neoplasia or malignancy, infections, surgical margin status, pathologic staging of tumors, and determination of adequacy of tissue for final diagnosis. The nature and/or extent of the immediate surgical procedure often hinges on the result of the intraoperative consultation, thus, ACCURACY is the most important quality indicator of this laboratory test. Intraoperative consultation TURNAROUND TIME is also an extremely important quality measure, for it may determine the time the patient spends in the operating room under anesthesia. Excellent intraoperative consultation accuracy and optimally brief turnaround time can contribute in a meaningful way to optimal patient care.

The types of intraoperative consultations are determined by the nature of the specimen, and include gross examination only, cytologic preparations (touch preps or smears), and “frozen sections”. The various steps that may contribute to the overall turnaround time of an intraoperative consultation include: specimen transportation, inking of surgical margins (different colors for specimens oriented by the surgeon), dissection/sectioning of specimen, selection of proper tissue sample for frozen section, freezing of tissue, frozen section slide preparation, and slide interpretation by the pathologist. Certain specimens such as breast biopsies, skin excisions, and head and neck tumor resections traditionally have a longer turnaround time by virtue of requiring meticulous inking of oriented surgical margins prior to dissection and frozen section preparation. Other specimens such as thyroid lobes, gynecologic tumor specimens, and soft tissue tumors may have a lengthy turnaround time due to the need for multiple frozen section blocks and/or slides, and the use of one or more pathologist “second observers” in the generation of a frozen section diagnosis.

Over the past eight months, the surgical pathology section has undertaken a detailed prospective analysis of intraoperative consultation turnaround time for a random sample of 126 cases that were accessioned in our Histology area. Recorded data included all the steps in the process from receipt of the specimen in the lab to communication of the verbal result to the surgeon. Simultaneous arrival/handling of multiple frozen section specimens, use of any “second observers”, and any technical difficulties encountered were also recorded. Note was also made of whether the surgeon was still in the O.R. when contacted with the intraoperative consultation result.

The analysis of our random intraoperative consultation sample revealed a total intraoperative consultation TAT of less than or equal to 20 minutes for 82% of cases, and less than or equal to 15 minutes for 60% of cases. Approximately two-thirds of cases with a total TAT of greater than 20 minutes were breast or skin specimens. The steps contributing most significantly to overall TAT were specimen handling time (average 4.7 minutes; >8 minutes for 17% of cases), and frozen section slide preparation time (average 5.1 minutes; > 5 minutes for 52% of cases). The need for second opinion (19% of cases), and multiple simultaneous intraoperative consultations (18% of cases) also added to turnaround time. Of interest, for 20% of the cases, the surgeon had already vacated the operating room by the time the pathologist called the O.R. with the intraoperative consultation result.

In summary, intraoperative consultations are multi-step procedures with a total TAT that rarely exceeds 20 minutes. Although the perceived “delays” in TAT are usually justifiable for certain types of specimens (such as breast or skin specimens requiring orientation, color-coded inking of specific margins prior to sectioning, and need

for multiple frozen section blocks), or due to difficulty of slide interpretation requiring second observers, our detailed breakdown of TAT steps has identified specimen handling time and frozen section slide preparation time as specific areas for continued future monitoring and potential improvement.

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