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BRONCHOALVEOLAR LAVAGE (BAL) WITH SURFACTANT IN SEVERE UNILATERAL CHEST TRAUMA. A RANDOMIZED CLINICAL TRIAL

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Aim of the study: To evaluate the evolution of severe unilateral chest trauma, associated with pneumothorax and multiple rib fracture after protective ventilation or protective ventilation and BAL plus surfactant.

Study design: randomized clinical trial performed from 1 January 2001 to 31 December 2004.

Setting: two ICUs of important hospitals affiliated to Universities.

Case material: 44 patients, age 19-68 years, admitted to ICU for recent unilateral chest trauma, which need intubation and mechanical ventilation. Lung pathology was characterized by parenchymal haemorrhage, interstitial edema, localized or generalized alveolitis, consolidated hemorrhagic and necrotic lung areas, etc. associated with multiple anterior rib fracture (at least 4 ribs between 2 and 9).

Methods: All patients were artificially ventilated, after tracheal intubation, using a protective lung strategy (Tidal volume from 6 to 8 ml/kg, respiratory rate to maintain adequate minute volume and PEEP level according to inferior flex point of volume pressure curve). After 1 hour from stabilization, the patients were randomised in two groups. The 1st group (22 cases) maintained only the ventilatory treatment begun. The 2nd group (22 cases) was submitted to BAL with 100 ml of saline solution and 2.5 mg/ml natural surfactant (Curosurf®). 250mg of natural surfactant was supplemented after one hour in the same area where BAL was performed. After BAL, the 2nd group was re-connected to ventilator with the same parameters as those of the untreated group.

Results: The two groups were similar in terms of age and severity score (APACHE II and SAPS). 1st group. In all patients, at between 24 and 36 hours from artificial ventilation, it was necessary to increase the minute volume progressively by 30-50% and FiO₂ up to 0.5 and in 10 cases up to 0.7. The lung pathology was resolved slowly and lung contusion evolved to progressive consolidation and extended to a large part of the homolateral lung and in 50% of cases also to the contralateral lung. Ten patients developed moderate ARDS. Between the 5th and 6th day of treatment, all patients developed fever, leucocytosis and increase in inflammatory and sepsis mediators controlled by antibiotics. Extubation took place on average after 9 days and in no cases prior to the 6th day of artificial ventilation. All patients survived, although 25% required prolonged hospital stay of over one month for respiratory rehabilitation. 2nd group. Bal was performed without complications. Moderate oxygen desaturation and increase in EtCO₂ were found in 25% of cases, and resolved spontaneously within 1 hour. Ventilation improved progressively over 24 hours, allowing a reduction in minute volume to ensure normal paCO₂. At 24th hour all patients no longer required FiO₂ over 0.35. Broncho-tracheal secretions remained slightly blood-stained during the first 24 hours, becoming progressively clearer in colour, more fluid and more easily drainable. No complications deriving from infection were noted in any patient. Extubation was performed at average 4 days.

All patients survived and none required prolonged respiratory rehabilitation therapy (no longer than 10 days).

Comments: The methodology appears to be effective and highly therapeutic, reducing the length of both intubation and artificial ventilation significantly. The removal of extraneous matter, a consequence of cell and parenchymal tissue decay, and of surfactant inhibitors allow recruitment of the lung, re-opening of obstructed airways and maintaining the alveoles and terminal bronchioles open. Administration of surfactant is useful both for the treatment of surfactant deficiency due to primitive lung pathology and to supplement the surfactant removed by BAL.