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LETTER TO EDITOR

Full thickness chest wall defection and lung injury by electrical burn: A 5-years-old child reconstruction case

To the editor,

We want to present an unusual case of child with ribs exposure and lung injury by high-voltage electrical burn. Electrical injury occasionally occurred in workplace, however child case with such extensive damage is rare and challenging. This case was followed up for 2 years, satisfactory outcomes were obtained with no thoracic deformity or respiratory disorder. We expected this report may provide reconstructive choice for similar cases.

A 5-year-old boy subjected to high-voltage electrical burn was transferred to our department on 22 April 2016. He was injured by a shock when playing below an electrical transformer box. The patient with exposed intra-thoracic structures and burned upper limbs was immediately treated by wound bandaging and chest wall fixing in regional E.R before sent to our hospital for emergency surgery. After stabilized and double checked the vital signs, the operation was performed by both thoracic and plastic surgeons.

The surgical planning including left arm amputation and chest wall debridement and reconstruction of the defect with a pedicled myocutaneous flap. With collaboration of thoracic surgeons, the chest wall was debrided including the lateral 5th, 6th and 7th burned ribs on the left side, the devitalized muscles and necrotic soft tissue, resulting in an extensive composite chest wall defect of 10*13 cm (Fig. 1A). The lobectomia pulmonalis was also performed when a burn injury on the left inferior lobe of the lung was found (Fig. 1B). Suture stabilization of the chest wall was performed between the ribs and a thoracic close drainage was placed to obliterate dead space (Fig. 1C). The resulting defect was reconstructed with a retrograde latissimus dorsic myocutaneous flap, which was carefully dissected and then rotated and transposed to cover the osseous and pleural exposure. And the rest wound and the donor site were covered with split-thickness skin graft from the left thigh and fixed by vacuum-assisted closure (Fig. 1D).

The child was stay in ICU for respiratory and circulatory function support and observed for 3 days before transferred to burn and plastic surgery department. Broad-spectrum antibiotics was used to prevent infection, as well as drainage, fixing, dressing and nutritional replenishment initiated on the first day. No flail chest was encountered. Due to partial skin graft necrosis and limb burn wounds, debridement and skin grafting were performed on the 11th, 24th and 38th postoperative days. The further postoperative recovery period was uneventful and the patient was discharged after 56 days.

The rehabilitation treatment was continued for an additional 4 months and followed-up for 2 years, he presents adequate thoracic wall coverage with no functional restriction, including respiratory function and mobility of the upper limb (Fig. 2).

The challenge of this case is the chest wall reconstruction. The full thickness contents damaged by the resultant high necrotic load of the electrical current can be life-threatening as various organ systems disorder and complications may arise owing to delayed or failed reconstruction in such scenario. But extensive composites chest wall defects require sophisticated surgical technique because of its multilayered nature. The skeletal supporting structures composed of ribs protect the intra-thoracic structures and adequate the respiratory function. The soft tissues of the chest wall are largely the skin, respiratory muscles and the parietal pleura, which help preserving the chest dynamic stability and coordinating respiratory movements and lung expansion.[1] As to this child case, whose bony defect was 10 cm in diameter and involving 3 adjacent ribs partial resection, tending to have higher postoperative complications such as atelectasis and pleural effusion, the restoration of chest wall integrity is vital for preservation of organ systems and adequate respiratory functions. There are various options to reconstruct chest wall. Besides Titanium Micromesh,[2] implant materials such as synthetic and/or acellular dermal matrices, and polypropylene mesh were

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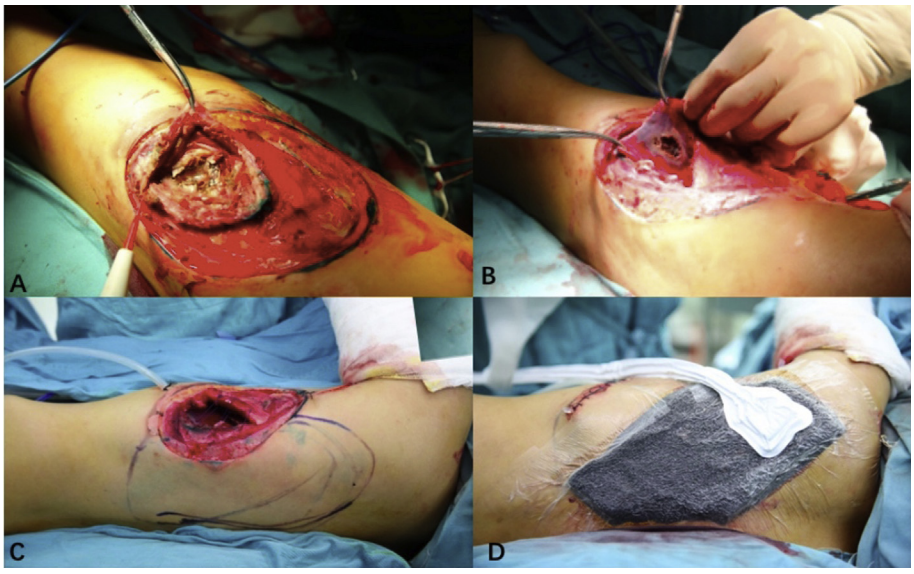

Figure 1 A: debridement the lateral burned ribs, the devitalized muscles and necrotic soft tissue, resulting in an extensive composite chest wall defect of 10*13 cm.B: A burn injury on the left inferior lobe of the lung was found. C: The bony defect was 10 cm in diameter and involving 3 adjacent ribs partial resection. The free margin of ribs was fixed for skeletal stabilization. D: The rest wound and the donor site were covered with split-thickness skin graft from the left thigh and fixed by vacuum-assisted closure.

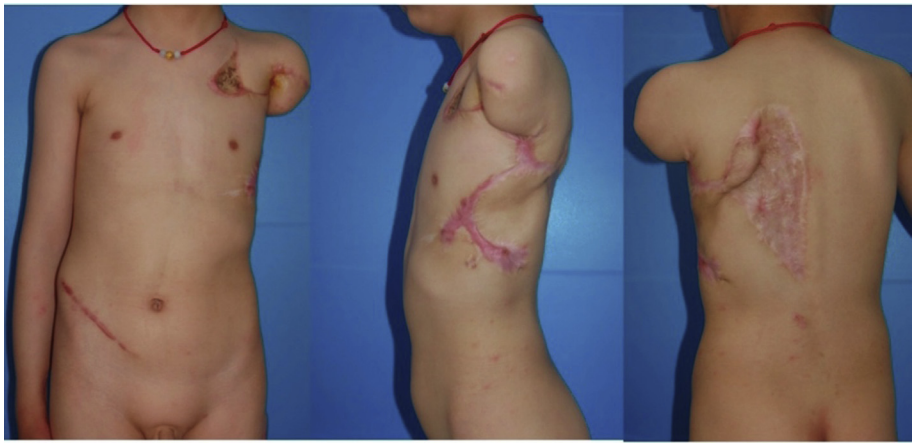

Figure 2 2 years postoperatively: adequate thoracic wall coverage with no functional restriction.

nowadays give good function and aesthetic result to reestablish the continuity of the bony framework and prevent chest wall flail.[3] However, the implants were not used considering the high probability of limitation of thoracic development and infection after electrical burn. We choose a retrograde latissimus dorsic myocutaneous flap to cover the osseous and pleural exposure considering its reliable blood supply and strong anti-infection ability.[4] The donor site and the residual wound were cover by split-thickness skin graft. The vacuum-assisted closure is good for graft fixing and chest wall immobilization postoperatively. ICU management and careful respiratory management were important for organ function recovery. Satisfactory cosmetic and functional outcomes were obtained, with no thoracic deformity or respiratory disorder after 2 years. We assume that with suture stabilization, the chest wall is transiently reinforced, and the flap is made to adhere to the thorax, providing greater stability and protection against infections. Therefore, the surgical procedure and experience may offer potential treatment for patients in similar situations.

Conflicts of interest statement

None.

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None declared.

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