

Patient Treated Successfully with RotoProne™ Therapy System Following ARDS Secondary to Smoke Inhalation and Cutaneous Burn Injury

Burn Center West Penn Hospital Pittsburgh, Pennsylvania

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Patient

15-year-old male admitted to emergency department with 80% total body surface area burn. Prior medical history of attention deficit disorder with hyperactivity disorder. Currently prescribed stimulant. No known drug allergies.

Mechanism and Diagnosis

Examination revealed 80% BSA burn injury; 100% third degree (full thickness). Inhalation injury was suspected.

Progress Prior to RotoProne™ Therapy

Hospital Day 1:

00:10 Patient was intubated at the scene. Arterial Blood Gas was drawn on admission and revealed PaO₂ HIGH, PaCO₂ 53.2mmHg, pH 7.22, and SaO₂ 99.8 while on 100% FiO₂, PEEP 5cmH₂O and tidal volume (TV) 600 ml. A carboxyhemoglobin was done and was negative. Optimum fluid resuscitation and analgesia were sought. Chest x-rays showed clear lung fields.
19:00 FiO₂ had decreased to 35% with PaO₂ of 136 mmHg. Pain medication was continued and a benzodiazepine was initiated. Steroid therapy was also initiated.

Hospital Day 2:

02:00 SaO₂ dropped to 82%.
23:00 Patient was placed on pressure control ventilation (PCV) with inspiratory pressure (IP) 25cmH₂O, PEEP 10cmH₂O, FiO₂ 50%, and I:E ratio 1:1.5. ABG showed: PaO₂ 51.7mmHg, PaCO₂ 35.5mmHg, pH 7.39 and SaO₂ 86%. CXR showed edema in the lungs with moderate right pleural effusion, and right lower lobe pneumonia.

Hospital Day 3:

06:00 Antibiotic therapy, diuretics and total parenteral nutrition were initiated.
14:48 CXR showed progressive air space opacity in both lungs (Picture A) with bilateral pleural effusions.
18:35 ABG showed PaO₂ 56.8mmHg, PaCO₂ 46.2mmHg, pH 7.35 and SaO₂ 89.3% while on PCV, IP 23cmH₂O, FiO₂ 90%, PEEP 14cmH₂O and I:E ratio 1:1. At this time, the treating physician ordered the RotoProne™ Therapy System, due to progressive worsening of ARDS and the need to place the patient in the prone position. The patient's level of acuity would have made manual prone positioning extremely high risk. The RotoProne™ Therapy System minimized the risk of proning by automating the process. The treating physician ordered prone therapy for 6 hours, and return to supine for 1 hour.

RotoProne™ Therapy Initiation (Table 1)

RotoProne™ Therapy Day 1:

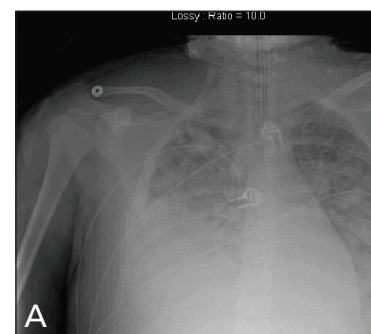
20:30 Patient was placed on the RotoProne™ Therapy System without incident on day three of hospitalization. The goal of proning therapy for this patient was to help improve arterial oxygenation.¹⁻³ Initial settings included rotated 40° (Kinetic Therapy) in the prone position with pause times of 10 minutes each side and 5 minutes in the center. Planned supine respite for 1 hour after 6 hours.
21:00 ABG showed PaO₂ 62.5mmHg, PaCO₂ 45.4mmHg, pH 7.35 and SaO₂ 91% while on PCV, IP 23, FiO₂ 70%, PEEP 14cmH₂O and I:E ratio 1:1. Patient tolerated turning 40° to each side. His oxygen saturation began to climb and his FiO₂ was decreased accordingly.

RotoProne™ Therapy Day 2:

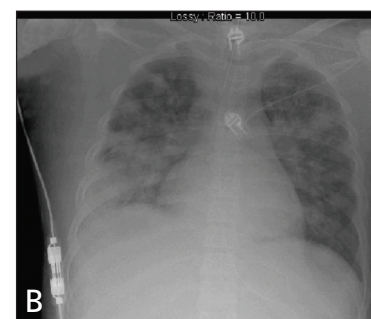
03:00 The patient was turned to the supine position. He became hypotensive and his SaO₂ dropped to 65%. He was immediately placed back to the prone position, and his SaO₂ quickly returned to >90%.
06:00 ABG showed PaO₂ 114mmHg, PaCO₂ 39.8mmHg pH 7.40 and SaO₂ 98%, while on PCV, IP 19, FiO₂ 50%, PEEP 14cmH₂O and I:E ratio 1:1. He remained prone with 40° rotation to each side.
07:30 The patient was turned supine and began to desaturate immediately. The physician bagged the patient while a CXR was taken. The CXR showed continued profuse airspace pattern in the lungs, likely ARDS, but pneumonia was not excluded. Diuretic dosage was decreased. The patient was placed prone again.
14:00 The patient was turned to the supine position. He initially desaturated to 85-87%, but slowly recovered to 90-92%.
15:30 Another ABG was done and showed PaO₂ 81.9mmHg, PaCO₂ 47.7mmHg, pH, 7.36 and SaO₂ 95.7%. The patient was never placed back into the prone position, but continued to receive rotational therapy of 40° to each side while supine. That evening, he became hypotensive. Diuretic was stopped and a bolus of lactated Ringer's solution and albumin was administered.

RotoProne™ Therapy Day 3:

09:19 ABG showed continued areas of patchy airspace changes possibly due to edema or pneumonia. Right pleural effusion continued. Patient continued to receive Kinetic Therapy of 40° to each side in the supine position only.



Hospital Day 3: RotoProne™ Therapy initiated



Day 3 of RotoProne™ Therapy System

16:10 ABG improved to PaO₂ 160mmHg, PaCO₂ 46.4mmHg, pH 7.35, SaO₂ 99%, on PCV IP 17, FiO₂ 55%, PEEP 12cmH₂O and I:E ratio 1:1 (Picture B).

RotoProne™ Therapy Day 4:

07:08 CXR showed pulmonary edema, bilateral diffuse airspace disease likely due to edema or pneumonia.

17:35 ABG showed PaO₂ 102.3mmHg, PaCO₂ 36mmHg, pH 7.39, SaO₂ 97.6%, while on PCV IP 17, 50% FiO₂, PEEP 8cmH₂O and I:E ratio 1:2. Patient continued to receive Kinetic Therapy of 40° throughout the day in the supine position. Steroid therapy was stopped.

RotoProne™ Therapy System Discontinued

On **hospital day 5**, the patient was removed from the RotoProne™ Therapy System and placed on a continuous lateral rotation therapy surface in preparation for excision of burns with split-thickness grafting. Post-operative ABG showed PaO₂ 110.4 mmHg, PaCO₂ 43.5 mmHg, pH 7.38, SaO₂ 98%, on FiO₂ 50%, 14 IMV, PS 10 and PEEP 5 cmH₂O. The patient was extubated on **hospital day 15**.

Patient Discharge and Follow-up

Follow-up on **hospital day 16** showed ABG on 3 liters oxygen via nasal cannula: PaO₂ 110mmHg, PaCO₂ 40.7mmHg, pH 7.44 and SaO₂ 98%. CXR showed slowly improving pneumonia. Patient was intubated intermittently for OR procedures, but remained on room air until discharged to rehabilitation facility on **hospital day 31**. Patient subsequently discharged to the home to receive in-home physical therapy and continued to improve. No oxygen was needed at home.

Patient Summary Data

Contemporary management of ARDS includes prone positioning.¹⁻⁴ Patient's crescendo pattern of hypoxemia despite traditional intervention warranted a therapeutic trial of prone positioning. Due to his hemodynamic instability, manually placing him in the prone position may have proved fatal. In this case, the RotoProne™ device made proning feasible and safe. After 30 minutes of RotoProne™ Therapy, the steady decline in oxygenation stopped and began to increase. After ten hours of RotoProne™ Therapy, the patient's oxygenation showed a marked increase, as evidenced by the improved blood gases and chest x-rays. The patient did develop a prone dependency but was stabilized in the supine position after 16-18 hours of therapy.

In the opinion of the treating clinicians, the RotoProne™ Therapy System was simple to operate, and the transitional process of placing the patient on the bed took minimal effort. The patient survived this critical condition secondary to burn injury^{5,6} and was discharged to a rehabilitation unit on **hospital day 31** without any further respiratory complications.

Table 1. Arterial Blood Gas Progression^{7*}

RotoProne™ Therapy Days	PaO ₂ (mmHg)	PaCO ₂ (mmHg)	pH	SaO ₂ (%)	FiO ₂ (%)	PEEP (cmH ₂ O)	Degree of Rotation, Pause	Position
1 (18:35-2 hrs prior to RotoProne™ Therapy System placement)	56.8	46.2	7.35	89.3	90	14	none	Supine
1 (21:00-30 min post RotoProne™ Therapy System placement)	62.5	45.4	7.35	91	70	14	40°, 10 min pause each side, 5 min center	Supine position briefly attempted after 6 hrs prone
2 (06:00)	114	39.8	7.40	98	50	14	40°, 10 min pause each side, 5 min center	Prone: would not tolerate supine
2 (15:30)	81.9	47.7	7.36	95.7	55	14	40°, 10 min pause each side, 5 min center	Initial desat in supine position, then recovery; patient then placed in supine position only
3 (16:10)	160	46.4	7.35	99	55	12	40°, 10 min pause each side, 5 min center	Supine
4 (17:35)	102.3	36	7.39	97.6	50	8	40°, 10 min pause each side, 5 min center	Supine
5 (14:24 approx 4 hrs post discontinuation RotoProne™ Therapy System placement)	110.4	43.5	7.38	98	50	5	CLRT	Supine
Follow-up 14 days post discontinuation RotoProne™ Therapy System placement	110	40.7	7.44	98				Supine

* Clinical data in table referenced from West Penn Hospital (Pittsburg, PA, USA) facility medical records, 2005.

References

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- Data based on West Penn Hospital (Pittsburgh, PA, USA) records, 2005.

NOTE: As with any case study, the results and outcomes should not be interpreted as a guarantee or warranty of similar results. Individual results may vary depending on the patient's circumstances and condition. Unless otherwise specified, any economic value or savings reported is based on data provided by the facility/clinician and the observations/experience of the clinician involved in the case. Savings are estimates only and specific to the individual case. Savings may not be typical and may vary.

Caution: Federal law restricts this device to sale/rental by or on the order of a physician.

Note: RotoProne™ Therapy System units have specific indications, contraindications, safety information and instructions for use. Please consult product labeling and instructions for use prior to use.

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