

# ABRA Abdominal Wall Closure Clinical and Economic Highlights

## Highlights

**In 92% of cases, full thickness primary closure of complex open abdomens was achieved in an average of 7 days by using ABRA Abdominal Wall Closure with Negative Pressure Wound Therapy (NPWT).<sup>1</sup>**

ABRA + NPWT vs. NPWT alone

- Majority primarily closed fascia vs. the majority left with mid-line hernia (92% vs. 36% fascial closure)
- 50% reduction in abdominal OR procedures (6.8 vs. 13.7)
- 68% reduction in the number of days to any closure (15.8 vs. 50.1)
- 73% reduction in fistula formation (1 vs. 4)
- No skin grafts required when using ABRA vs. 43% of patients without ABRA required skin grafts
- **Estimated cost reduction of \$12,370 to \$47,070 per patient**

**ABRA Abdominal Wall Closure and NPWT is an easy and reproducible option for primary fascial closure following severe Abdominal Compartment Syndrome (ACS).<sup>2</sup>**

**Achieve primary fascial closure following decompressive laparotomy using ABRA Abdominal Wall Closure.<sup>3</sup>**  
**Using ABRA Abdominal Wall Closure resulted in a 95% reduction in wound area.<sup>4</sup>**

**ABRA Abdominal Wall Closure can restore lost abdominal domain and achieve complete repair of the musculofascial support of the abdominal wall, achieving primary closure.<sup>5</sup>**

**ABRA uses significantly fewer OR resources, 70% fewer trips to the OR and 76% less OR time because it is adjusted at bedside and allows bedside dressing changes.<sup>6</sup>**

Many of the published articles and posters make reference to the challenges of the open abdomen and the traditional approaches to managing them. Traditional methods include the use of mesh, skin grafts, NPWT, tissue expansion, component separation, pedicled flaps and free-tissue transfer, many of which do not achieve a full thickness primary closure.

ABRA Abdominal Wall Closure is an advancement that achieves a low-tension primary closure of full thickness abdominal wounds, and directly results in patient benefits and significant cost saving.

**Mukhi, A.N., & Minor, S. (2014). Management of the open abdomen using combination therapy with ABRA and ABThera systems. Canadian Journal of Surgery, 57(5), 315-319. doi: 10.1503/cjs.026613**

- “The abdominal re-approximation anchor system (ABRA) is a dynamic closure system that uses elastomers through the full thickness of the abdominal wall that slowly pull the fascia together under continuous variable tension. It is easier to manage than mesh imbrication or sequential suturing and allows for the abdominal wall to oscillate with patient movement and breathing.”
- “Skin breakdown at the ABRA button site was observed in 1 (6%) patient.
- “Consequently, we hypothesize that if the ABThera had been used without the ABRA, a primary fascial closure rate of less than 70% would have been observed in these patients. In spite of this, the addition of the ABRA to the ABThera was associated with a successful primary fascial closure in 92% of patients in our study.”
- “We speculate that early application of the ABRA may be important in achieving successful primary fascial closure. Early application prevents fascial retraction and can start pulling the fascia together while the tissues are relatively more dynamic.”
- “In our series, we observed an equally high rate of closure in patients with nontraumatic etiologies, possibly because we used the ABThera system, which allowed for suctioning of the pelvis, paracolic gutters and subdiaphragmatic spaces.”
- “The ABRA system also leaves the edges of the native fascia undisturbed, which is an attractive advantage at the time of definitive closure.”
- “Consideration should be given to applying mechanical traction in addition to the ABThera in patients predicted to be at high risk for failure to achieve primary fascial closure.”

**Haddock, C., Konkin, D.E., & Blair, N.P. (2013). Management of the open abdomen with Abdominal Reapproximation Anchor dynamic fascial closure system. The American Journal of Surgery, 205(5), 528-530.**

- “Complete fascial apposition was achieved in 83% of the patients across the entire study and in 91% of the patients in the final 2 years. The incisional hernia rate was 13% at 6 months and 11% at 12 months.
- “The great benefit of the ABRA over other techniques is that these approximating moves can be made outside of the operating room without deconstructing the device itself. This is done at the bedside in the intensive care unit with the assistance of a nurse such that the surgeon need only be present for the tightening, which takes less than 5 minutes.”
- “Once the ABRA is applied initially, the patient has no need to return to the operating until final closure unless there are unforeseen reasons to do so.”
- “When faced with the dilemma of an open abdomen primary fascial closure is preferable to planned ventral hernia because the former results in fewer complications for patients.”<sup>1</sup>
- “We found a significant association between primary fascial approximation and a shorter duration of ABRA placement to removal. The median duration of application was 7 days in those who were primarily closed versus 17 days in those lacking primary fascial apposition...For those reasons, we recommend aggressive tightening of the elastomers to obtain closure as soon as possible.”

**Verdam, F.J., Dolmans, D.E., Loos, M.J., Raber, M.H., Wit, R.J., Charbon, J.A., & Vroemen, J.P. (2011). Delayed Primary Closure of the Septic Open Abdomen with a Dynamic Closure System. World Journal of Surgery, 35, 2348-2355.**

- “Delayed primary closure of OA in septic patients could be achieved in 88% with this new approximation system. However, the risk of hernia development remained. We consider this system a useful tool in the treatment of septic patients with an open abdomen.”
- “In conclusion, our results advocate the abdominal re-approximation system as a useful aid in the management of the infected open abdomen.”

**Reimer, M.W., Yelle, J.D., Reitsma, B., Doumit, G., Allen, M.A., & Bell, M.S. (2008). Management of open abdominal wounds with a dynamic fascial closure system. The Canadian Journal of Surgery, 51(3), 209-214.**

- “Results: The dynamic closure system remained in place an average of 48 days and was applied an average of 18 days after the beginning of treatment for the open abdominal wound. Delayed primary fascial closure was achieved in 14 of 23 patients (61%) without further surgery.”
- “An overall reduction in wound area of 95% was achieved. Conclusion: This dynamic wound closure technique permitted the delayed primary closure of open abdomens in 61% of cases when treatment was instituted an average of 18 days after initial laparotomy.”
- “Dynamic wound closure refers to placing the abdominal fascia under continuous variable medial tension that approximates the wound edges while allowing them to remain sufficiently mobile to oscillate with breathing and patient movement.”
- “A more timely application of the system at the first laparotomy that results in the open abdomen might yield faster and higher closure rates. Arguably, there would be less scar tissue present to impede fascial reapproximation.”

## References and Details

1. *Early Primary Closure of Open Abdominal Wounds Using the Abdominal Reapproximation Anchor (ABRA®) System.* Cinelli SM, Casey MJ, Kuhls DA, Browder TD, Coates JE, Fildes JJ. University of Nevada School of Medicine, Division of Trauma and Critical Care, University Medical Center of Southern Nevada, Las Vegas, NV. Poster: Southwestern Surgical Congress, Coronado, CA, March 22-25, 2009.

This retrospective study compared 27 patients, 13 for ABRA Abdominal Wall Closure combined with NPWT versus 14 treated using other methods including NPWT alone. The study concludes significant advantages of ABRA combined with NPWT, including improved patient outcomes and economic savings related to these outcomes (eg. fewer abdominal procedures, fewer hernias, higher closure rate and reduced hospital length of stay).



2. *Fascial Closure Following Severe Abdominal Compartment Syndrome: A Case Report Regarding an Efficient Combination of Dynamic Abdominal Closure and Negative Pressure Wound Therapy.* Ferreira F, Barbosa E, Guerreiro E, Santos F, Soares G, Grade P, Fleming J. Department of Surgery, Hospital Pedro Hispano - ULS Matosinhos, Porto, Portugal. Poster: 4th World Conference Abdominal Compartment Syndrome, Dublin, Ireland, June 25-27, 2009.

There is increasing awareness of Abdominal Compartment Syndrome (ACS) and the need to manage it. In this published poster illustrating an experience using ABRA Abdominal Wall Closure in combination with EZCARE™ (trademark of Smith + Nephew), ABRA and negative pressure wound therapy was concluded to be an easy and reproducible option for primary fascial closure following severe Abdominal Compartment Syndrome (ACS). Of note are the morbidity and mortality rates (and their associated costs) associated with ACS, and the superior outcomes that are obtainable when ABRA is used.

3. *Case Discussion: Secondary ACS Due to Tight Abdominal Closure. Abdominal Compartment Syndrome (WSACS) Newsletter, December 2008, Volume 2, Issue 4, Pages 10 – 11*

A discussion on the published poster presented at the World Society of the Abdominal Compartment Syndrome (#2 above), is presented in the World Society of Abdominal Compartment Syndrome (WSACS) Newsletter and notes the ability to achieve primary fascial closure following a decompressive laparotomy using ABRA Abdominal Wall Closure.

4. *Management of Open Abdominal Wounds using a Dynamic Fascial Closure System.* Reimer MW, Yelle YD, Reitsma B, Doumit G, Allen MA, Bell MSG. *Canadian Journal of Surgery.* 2008 Jun;51(3):209-214.

This is an early study of 23 patients with open abdomens that could not be primarily closed, where an overall reduction in wound area of 95% was achieved using ABRA Abdominal Wall Closure. This study involved an early version of the ABRA Abdominal Wall Closure System and late management of open abdomens, where ABRA was placed an average of 18 days after the beginning of treatment for the open abdomen wound. In this early experience with ABRA, primary closure was achieved in 61% of these complex cases.

Today's results with ABRA are far superior to those shown in this study, due to updates in the ABRA system design, including the addition of a perforated silicone sheet to protect the bowel and to prevent granulation and adhesions, advances in procedural methods with ABRA, results of combined therapies (ABRA + NPWT) and the earlier placement of ABRA.

5. *Closure of Massive Abdominal Wall Defects - A Case Report Using the Abdominal Reapproximation Anchor (ABRA) System.* Urbaniak RM, Khuthaila DK, Khalil AJ, Hammond DC. *Annals of Plastic Surgery.* 2006 Nov;57:573-577.

A published case report using ABRA Abdominal Wall Closure System recommends ABRA as an effective instrument to accomplish closure of difficult wounds. This study describes the use of ABRA to restore lost abdominal domain and achieve a complete repair of the musculo-fascial support of the abdominal wall, achieving primary closure.

6. *ABRA Abdominal Wall Closure System with V.A.C.® Therapy Compared to V.A.C.® Alone in Management of Open Abdomen.* Hamilton D, Simpson M, Sonka B, Kearney P, Boulanger B, Bernard A, Chang P. University of Kentucky, Department of Surgery, Division of General Surgery, Lexington, KY.

Poster Presentation: Abdominal Wall Reconstruction Conference, Washington, DC, June 17-19, 2010

Poster presentation of interim data for 11 of 30 patients enrolled in the study. "Early data clearly demonstrates decreased resource utilization of the study group in terms of operating room use.

Additionally, the study group avoids the known risks associated with transportation of a critically ill patient such as loss of intravenous access, a need for additional ventilatory support, and cardiopulmonary arrest."

Copies of these and other supporting references are available from Southmedic on request.