

Beyond the Tourniquet: Junctional Hemorrhage During the Swords of Iron War

CPT Inbal Dym, MD

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Disclosures

- CPT Inbal Dym, MD has no conflict to report.
- This study was performed as part of the Israel Defense Forces Trauma and Combat Medicine Branch effort to improve the quality of combat casualty care and received no external funding or support.



Clinical case

Location: Gaza strip

Event: 4 casualties due to IED on a tank

Initial Exam: 1 casualty with high amputation of the left leg and multiple shrapnel injuries.

The casualty is responsive to pain, non-palpable radial pulse, pale.

POI Management: urgent evacuation, IO, FDP, Ketamine
Packing → Femoral pressure point

Air Evacuation: Unresponsive, spO_2 78%
continue with pressure point, whole blood
cricothyroidotomy – spO_2 rose to 90%

11:53
Time of event



12:01
Medical Squad treatment



12:20
Air Evacuation



12:36
Arrival to level B trauma center



Clinical case

Hospital

ER

loss of vital signs in the ER, Resuscitative Thoracotomy

Operating Room

Small bowel injury observed; bowel resection performed. Chest drains inserted.

CT

Active bleeding in the pelvis

Operating Room

Additional surgery performed to ligate the internal iliac artery + vein.
During the surgery, the patient received over 20 units of blood.

11:53
Time of event



12:01
Medical Squad treatment

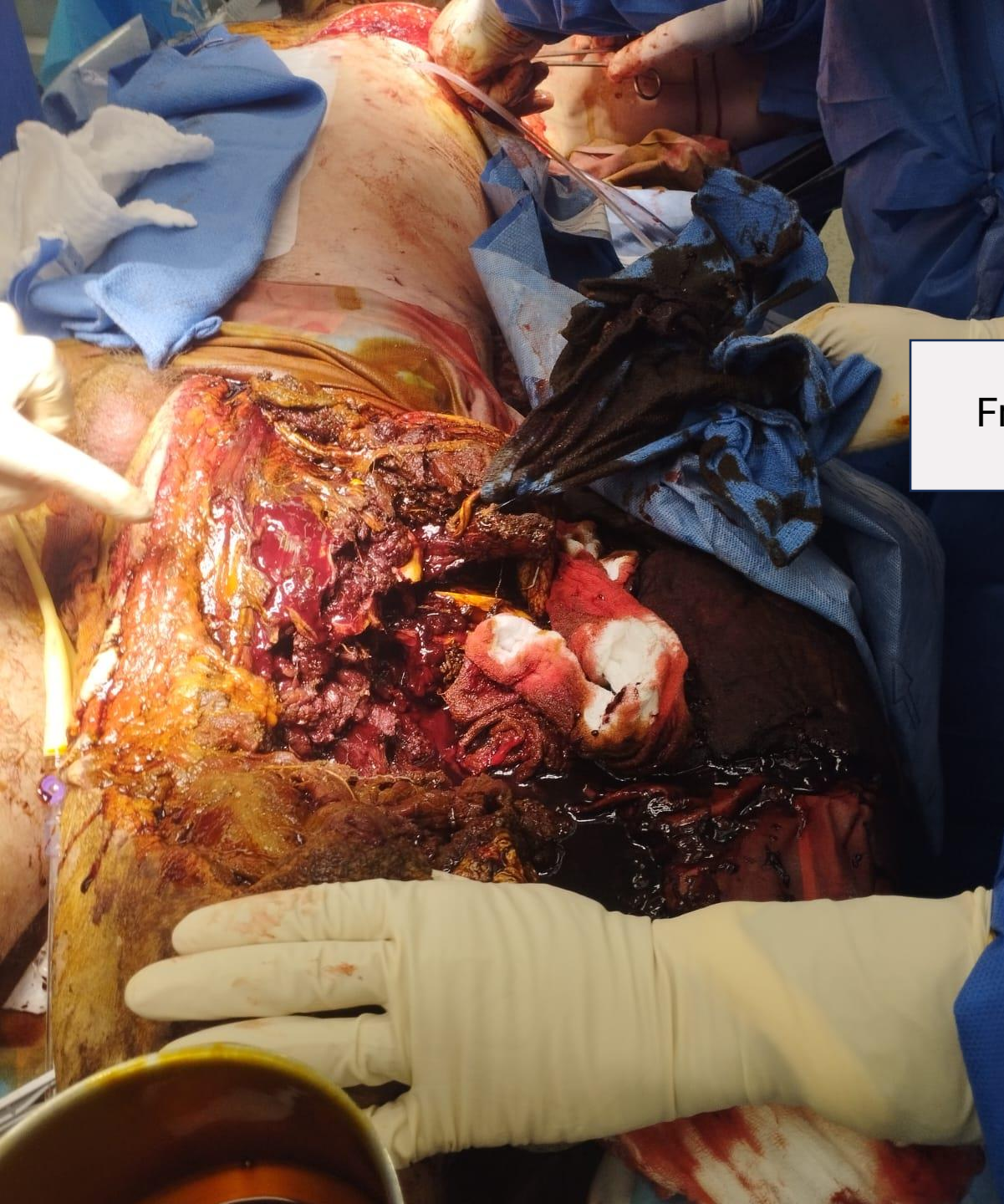


12:20
Air Evacuation

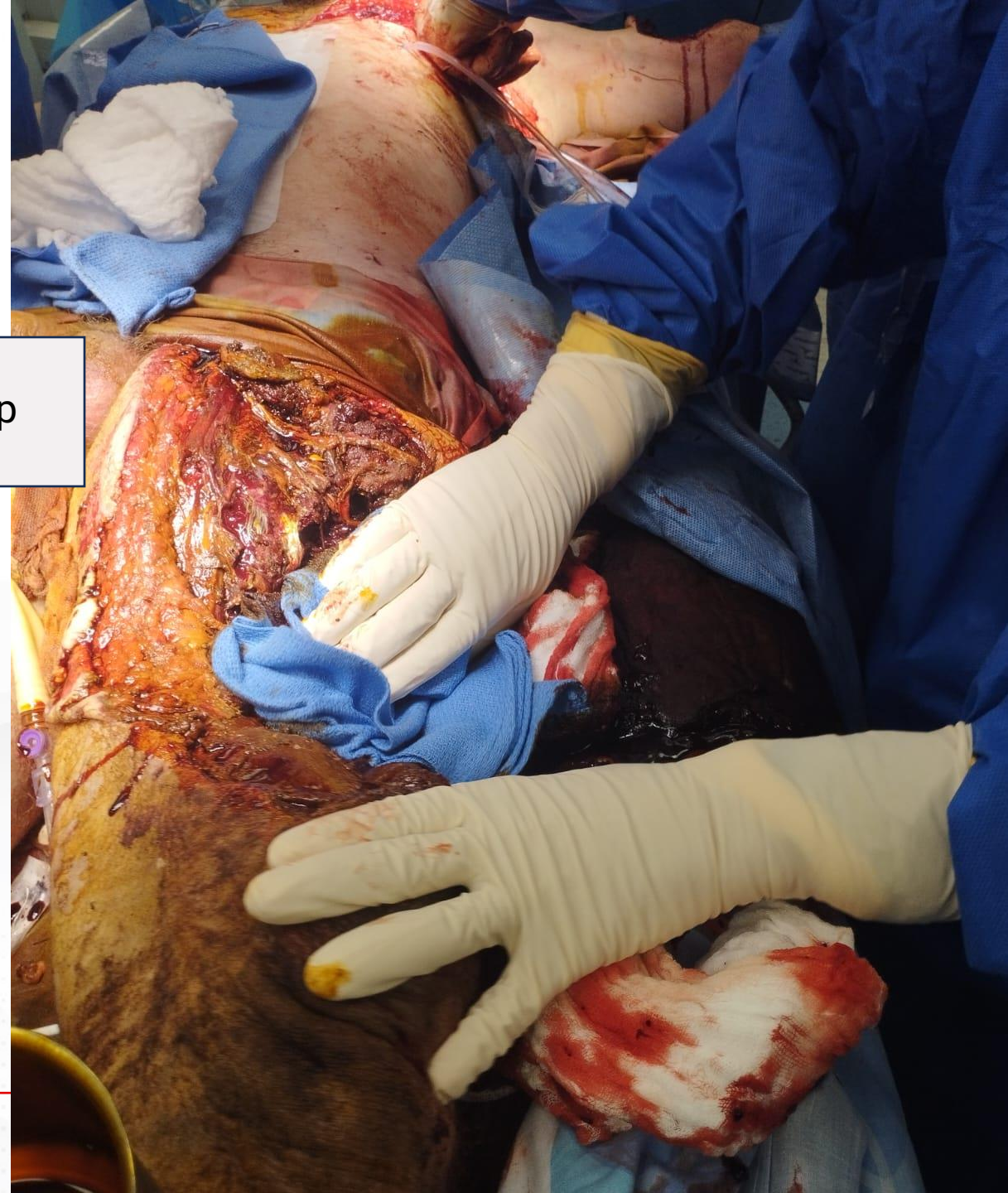


12:36
Arrival to level B trauma center





Front Hip



Background

The Journal of **TRAUMA**® Injury, Infection, and Critical Care

Tourniquets Revisited

Kenneth G. Swan, Jr., MD, Deborah S. Wright, MS, Stephanie S. Barbagiovanni, DO, Betsy C. Swan, BS, RN, and Kenneth G. Swan, MD

Table 4 Pressure Point Control

Artery Location	Brachial		Common Femoral Groin	Popliteal Knee
	Arm	Cubital Fossa		
Subjects	10	10	10	10
Loss of pulse	9	6	9	6
Return of pulse	8 (40.6 ± 6.5)*	3 (31.7 ± 6.0)	8 (20.6 ± 4.7)	4 (8.8 ± 1.3)
No. return of pulse	1	3	1	2
No. loss of pulse	1	4	1	4

* Parenthetical figures represent time in seconds (mean ± standard error) for return of distal pulse, despite sustained pressure on "Point" (artery/location).

Conclusions: Our data indicate that all tourniquets can be used successfully below the knee or elbow. It is probably the most readily available or simplest to procure/improvise. Pain is irrelevant. "Pressure Point Control" of extremity arterial hemorrhage is a **euphemistic misnomer.**



Background

Death on the battlefield (2001–2011): Implications for the future of combat casualty care

Brian J. Eastridge, MD, Robert L. Mabry, MD, Peter Seguin, MD, Joyce Cantrell, MD, Terrill Tops, MD, Paul Uribe, MD, Olga Mallett, Tamara Zubko, Lynne Oetjen-Gerdes, Todd E. Rasmussen, MD, Frank K. Butler, MD, Russell S. Kotwal, MD, John B. Holcomb, MD, Charles Wade, PhD, Howard Champion, MD, Mimi Lawnick, Leon Moores, MD, and Lorne H. Blackbourne, MD

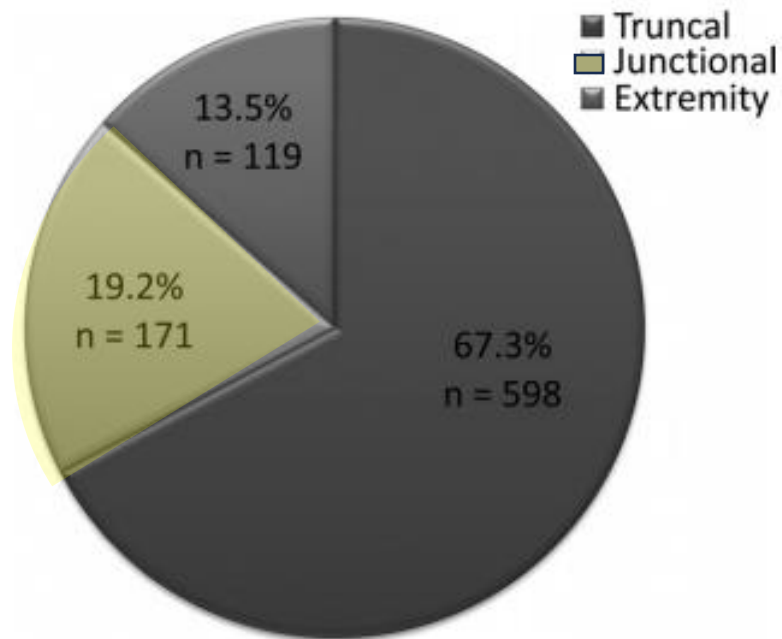


Figure 5. Anatomic focus of lethal PS hemorrhage.

Died of Wounds on the Battlefield: Causation and Implications for Improving Combat Casualty Care

Brian J. Eastridge, MD, Mark Hardin, MD, Joyce Cantrell, MD, Lynne Oetjen-Gerdes, MS, Tamara Zubko, Craig Mallak, MD, Charles E. Wade, PhD, John Simmons, MD, James Mace, MD, Robert Mabry, MD, Rose Bolenbaucher, MD, and Lorne H. Blackbourne, MD

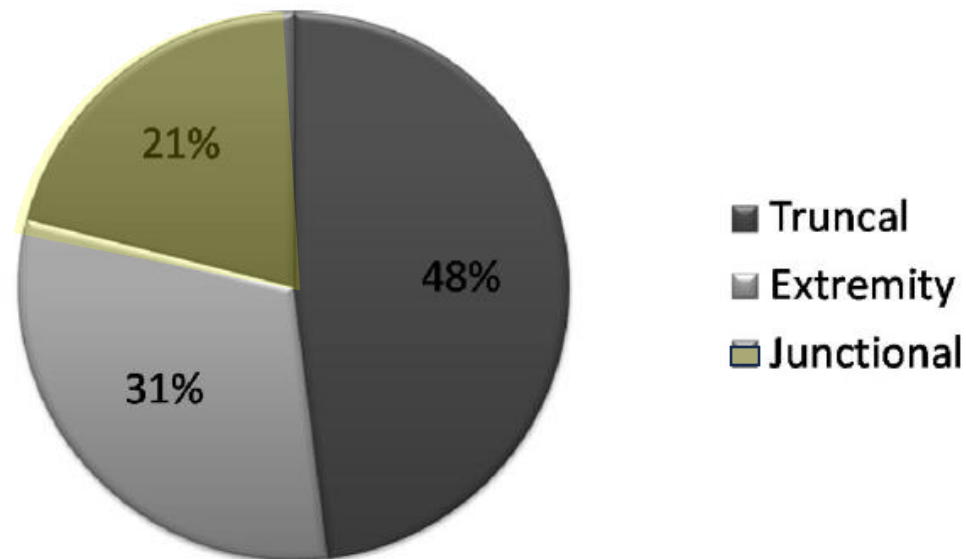


Figure 5. Main hemorrhage focus by anatomic region.



Eastridge BJ, Hardin M, Cantrell J, Oetjen-Gerdes L, Zubko T, Mallak C, Wade CE, Simmons J, Mace J, Mabry R, Bolenbaucher R. Died of wounds on the battlefield: causation and implications for improving combat casualty care. *Journal of Trauma and Acute Care Surgery*. 2011 Jul 1;71(1):S4-8.
Eastridge BJ, Mabry RL, Seguin P, Cantrell J, Tops T, Uribe P, Mallett O, Zubko T, Oetjen-Gerdes L, Rasmussen TE, Butler FK. Death on the battlefield (2001–2011): implications for the future of combat casualty care. *Journal of trauma and acute care surgery*. 2012 Dec 1;73(6):S431-7.



Background

Bleeding to death in a big city: An analysis of all trauma deaths from hemorrhage in a metropolitan area during 1 year

Kyle J. Kalkwarf, MD, Stacy A. Drake, PhD, MPH, RN, Yijiong Yang, BM, MHA, Caitlin Thetford, BA, BSN, RN, Lauren Myers, BS, BA, BSN, RN, Morgan Brock, BSN, RN, Dwayne A. Wolf, MD, PhD, David Persse, MD, Charles E. Wade, PhD, and John B. Holcomb, MD, Little Rock, Arkansas

TABLE 2. Preventability by Hemorrhage Location

	Total, n	PPH, n (%)	NPH, n (%)
Total	305	137 (44.9)	168 (55.1)
Truncal	255	102 (40.0)	153 (60.0)
Chest	91	22 (24.2)	69 (75.8)
Abdominal	19	16 (84.2)	3 (15.8)
Pelvis	0	0 (n/a)	0 (n/a)
Combined cavity	145	64 (44.1)	81 (55.9)
Truncal and junctional	23	14 (60.9)	9 (39.1)
Junctional	10	7 (70.0)	3 (30.0)
Truncal and extremity	7	4 (57.1)	3 (42.9)
Extremity	9	9 (100.0)	0 (0.0)
Extremity and junctional	1	1 (100.0)	0 (0.0)
n/a, Not available.			



Background

MAJOR HEMORRHAGE

TRANSFUSION

The effectiveness of the manual pressure points technique for hemorrhage control—The 2022 THOR pre-conference meeting experience

Patrick Thompson¹ | Elon Glassberg^{1,2,3,4} | Yuval Alon² | Christopher K. Bjerkvig^{5,6} | Hakon S. Eliassen^{1,6} | Irina Radomislensky^{2,7} | Geir Strandenes^{1,8} | Tomer Talmy^{2,9} | Ofer Almog^{2,9}

Results: All participants succeeded in achieving distal pulse cessation for both the supraclavicular and femoral points for a full minute. The median time to initial success was 3.0 (interquartile range 2.0–5.0) seconds in the supraclavicular point and 4.5 (interquartile range 3.0–6.0) seconds in the femoral point. Pain scores ranging between 0 and 3 were reported by most subjects during supraclavicular (68.4%) and femoral occlusion (84.2%).

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<https://doi.org/10.1080/10903127.2022.2122644>



FOCUS ON HEMORRHAGE



Manual Pressure Points Technique for Massive Hemorrhage Control—A Prospective Human Volunteer Study

Regina Pikman Gavriely^{a,b}, Yotam Lior^b, Shaul Gelikas^a, Shiran Levy^{a,c}, Alon Ahimor^{a,d}, Elon Glassberg^{a,e,f}, Shachar Shapira^{a,g}, Avi Benov^{a,e}, and Guy Avital^{a,b}

Results: For the supraclavicular point, success rates were 97.1% with a mean time to success of 12.5 (±20.9) seconds, lasting for 76.2% (±23.7) of the follow-up time. For the femoral point, success rates were 100% with a mean time to success of 5.5 (±4.3) seconds, lasting for 98.7% (±3.8) of the follow-up time.

Table 2. Efficacy and pain associated with pressure point application, n = 35.

	Supraclavicular	Femoral
Success rate, n (%)	34 (97.1%)	35 (100%)
Interval until complete flow cessation, mean ± SD, median (IQR), seconds.	12.5 ± 20.9 5.8 (3.6–12.7)	5.5 ± 4.3 3.6 (2.8–7.4)
Absolute flow cessation time during 180 seconds attempt, mean ± SD, median (IQR), sec.	137.1 ± 42.6 149.8 (103.8–175.1)	177.7 ± 7.9 180 (180–180)
Relative flow cessation time, mean ± SD, % of 3 minutes	76.2 ± 23.7%	98.7 ± 3.8%
Responder's perceived pain, median (IQR), visual analog score (1–10)	4 (3–6)	3 (1–5)
Model's perceived pain, median (IQR), visual analog score (1–10)	3 (2–5)	2 (0.5–3)

Thompson P, Glassberg E, Alon Y, Bjerkvig CK, Eliassen HS, Radomislensky I, Strandenes G, Talmy T, Almog O. The effectiveness of the manual pressure points technique for hemorrhage control—The 2022 THOR pre-conference meeting experience. *Transfusion*. 2023 May;63:S222-9.

Pikman Gavriely R, Lior Y, Gelikas S, Levy S, Ahimor A, Glassberg E, Shapira S, Benov A, Avital G. Manual Pressure Points Technique for Massive Hemorrhage Control-A Prospective Human Volunteer Study. *Prehosp Emerg Care*. 2023;27(5):586-591. doi: 10.1080/10903127.2022.2122644. Epub 2022 Sep 28. PMID: 36074122.



Manual Pressure Point

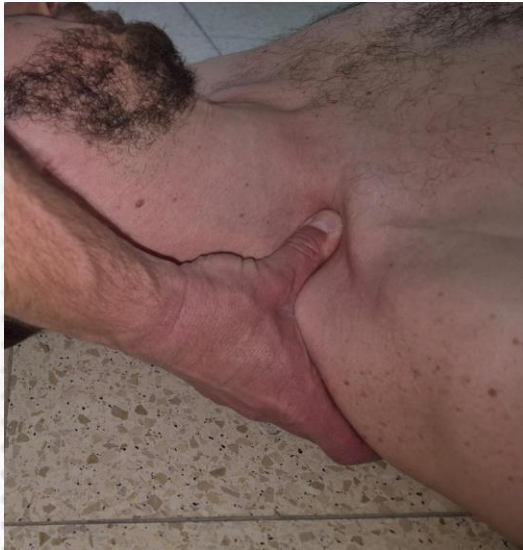
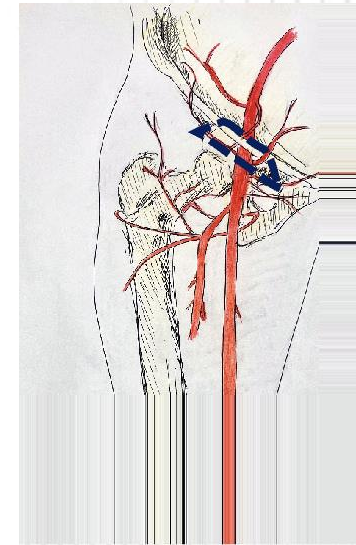
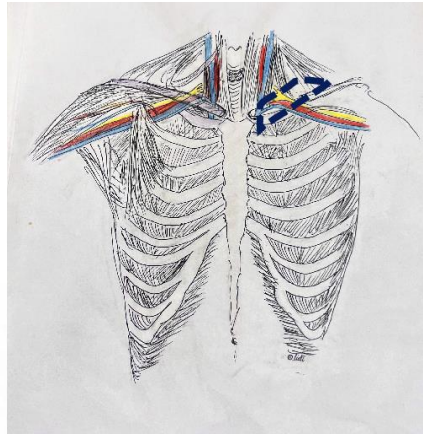
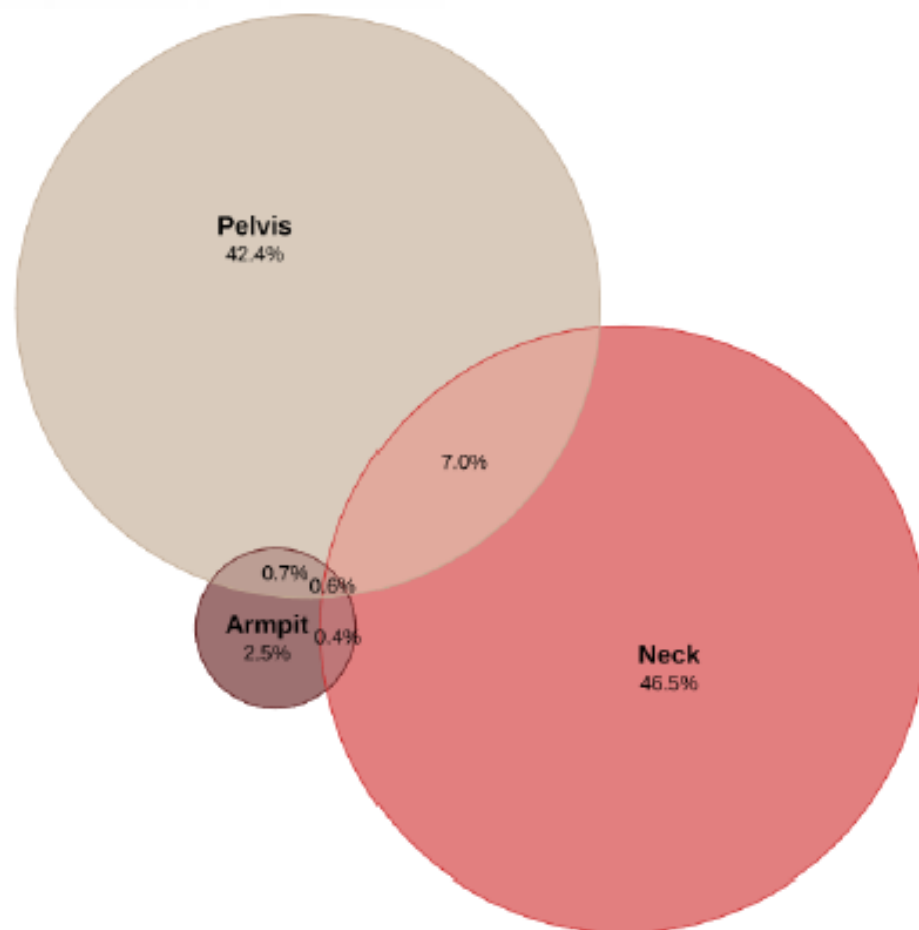


Figure 1. The manual pressure point technique in the (A) supraclavicular and (B) femoral locations.



Junctional Hemorrhage – Swords of Iron

oct.2023-oct.2025, N=852

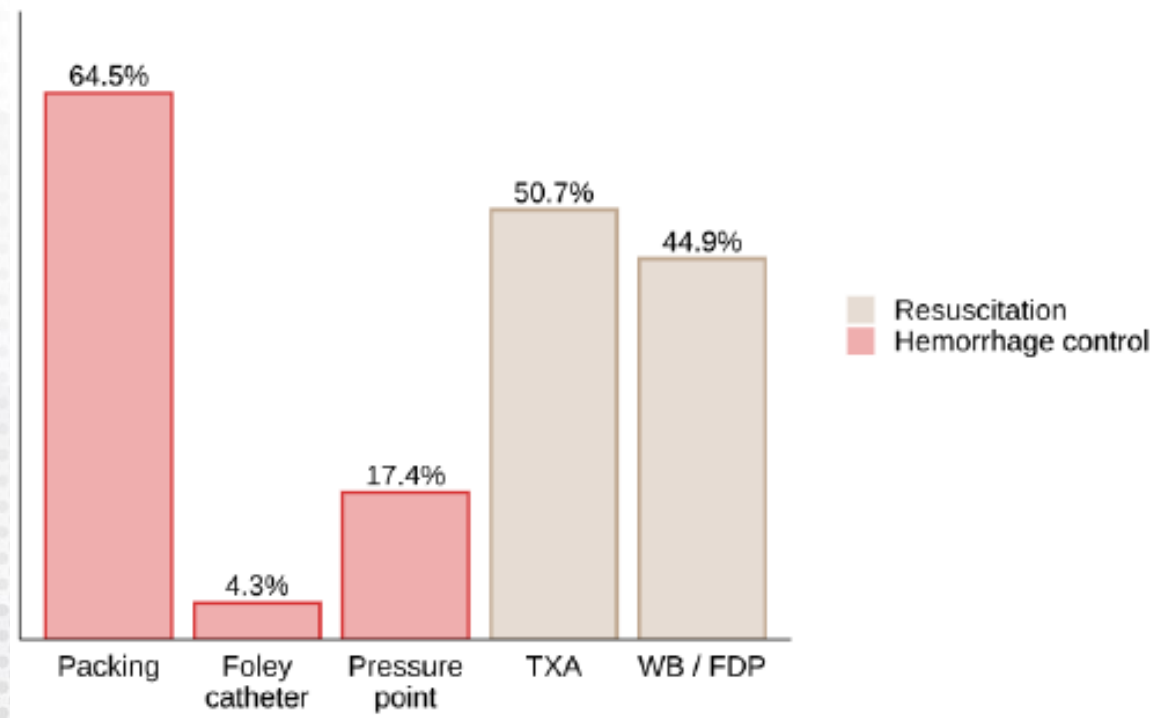


25% of casualties had
Major Bleeding

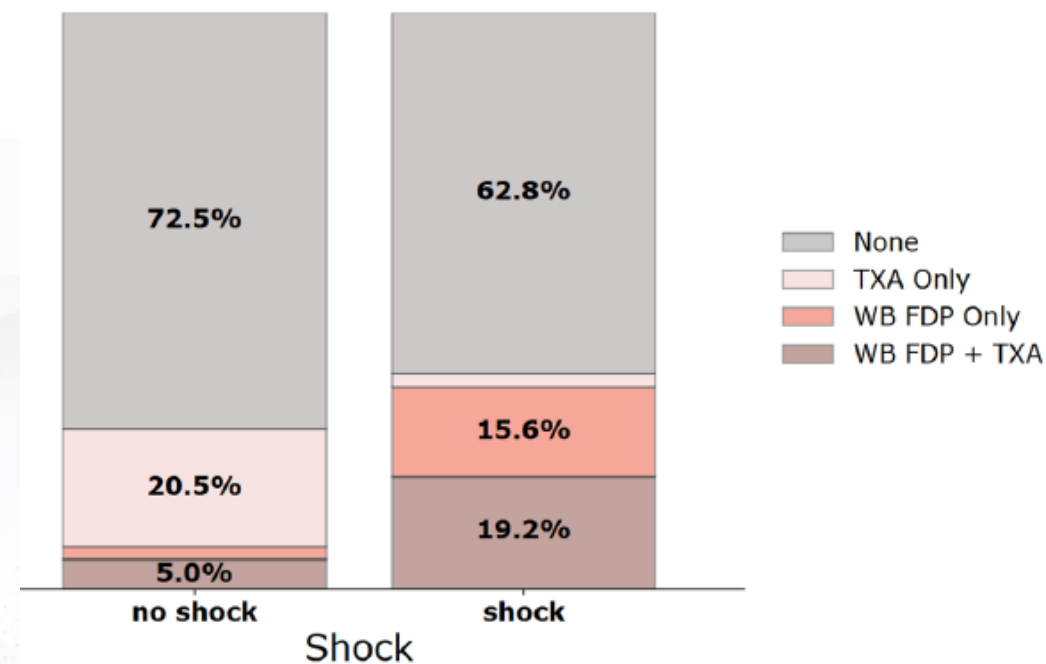


Junctional Hemorrhage – Management

Management among casualties with major bleeding



Resuscitation among casualties with junctional hemorrhage



Junctional Hemorrhage

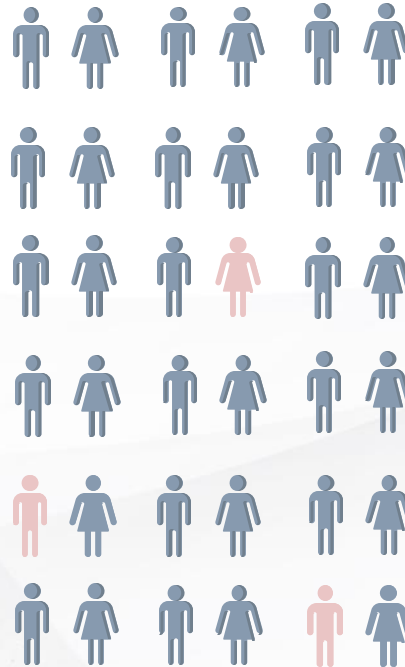
Oct. 2023 - March 2025

Major non-junctional hemorrhage



N=1034

Isolated major junctional hemorrhage



N=33

Major junctional hemorrhage



N=340



Major non-junctional hemorrhage



N=1034

Matching



Event Generator

No. of casualties

No. of fatalities

Mechanism of injury

Air Evacuation

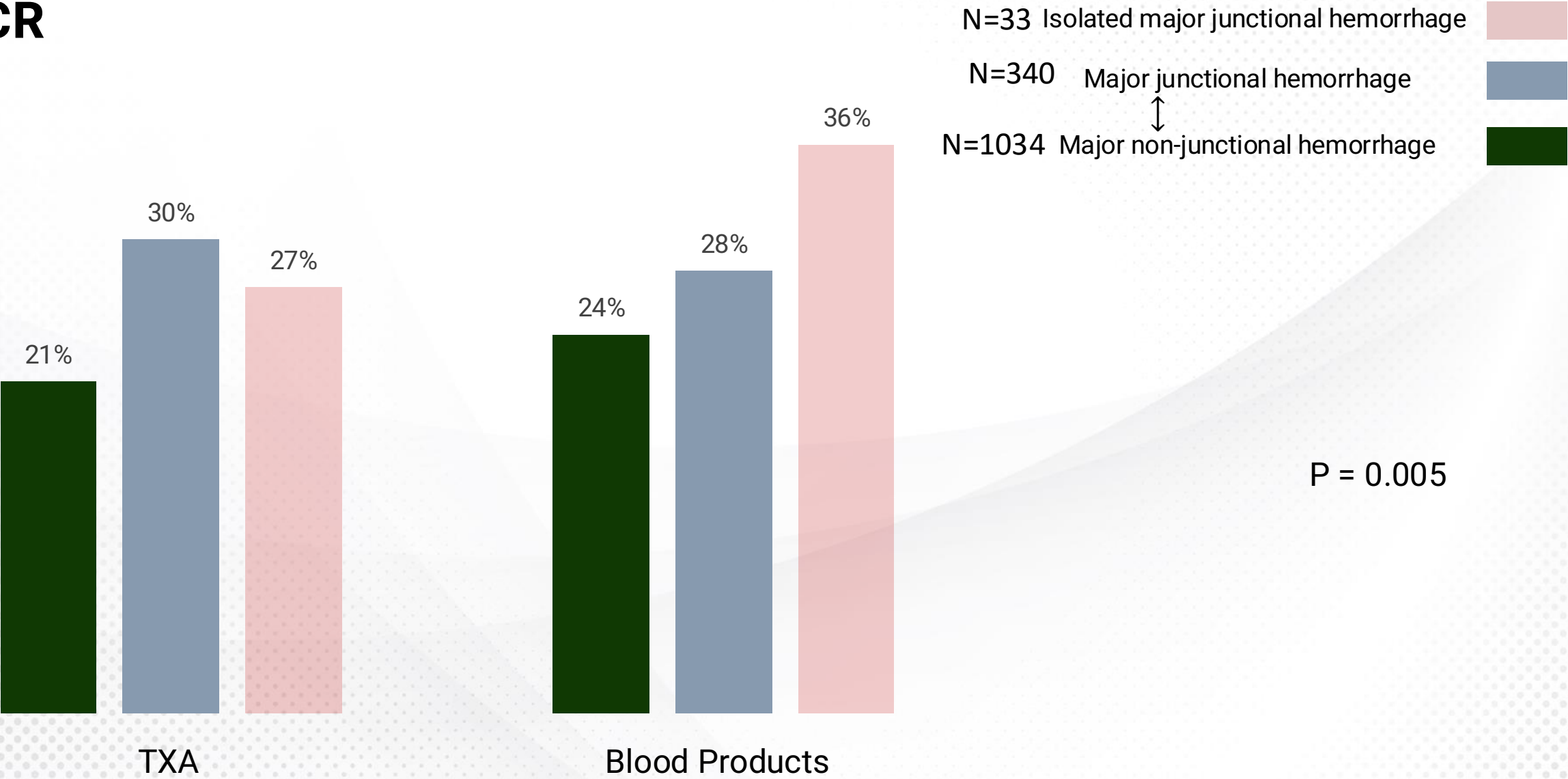
Major junctional hemorrhage



N=340



RDCR

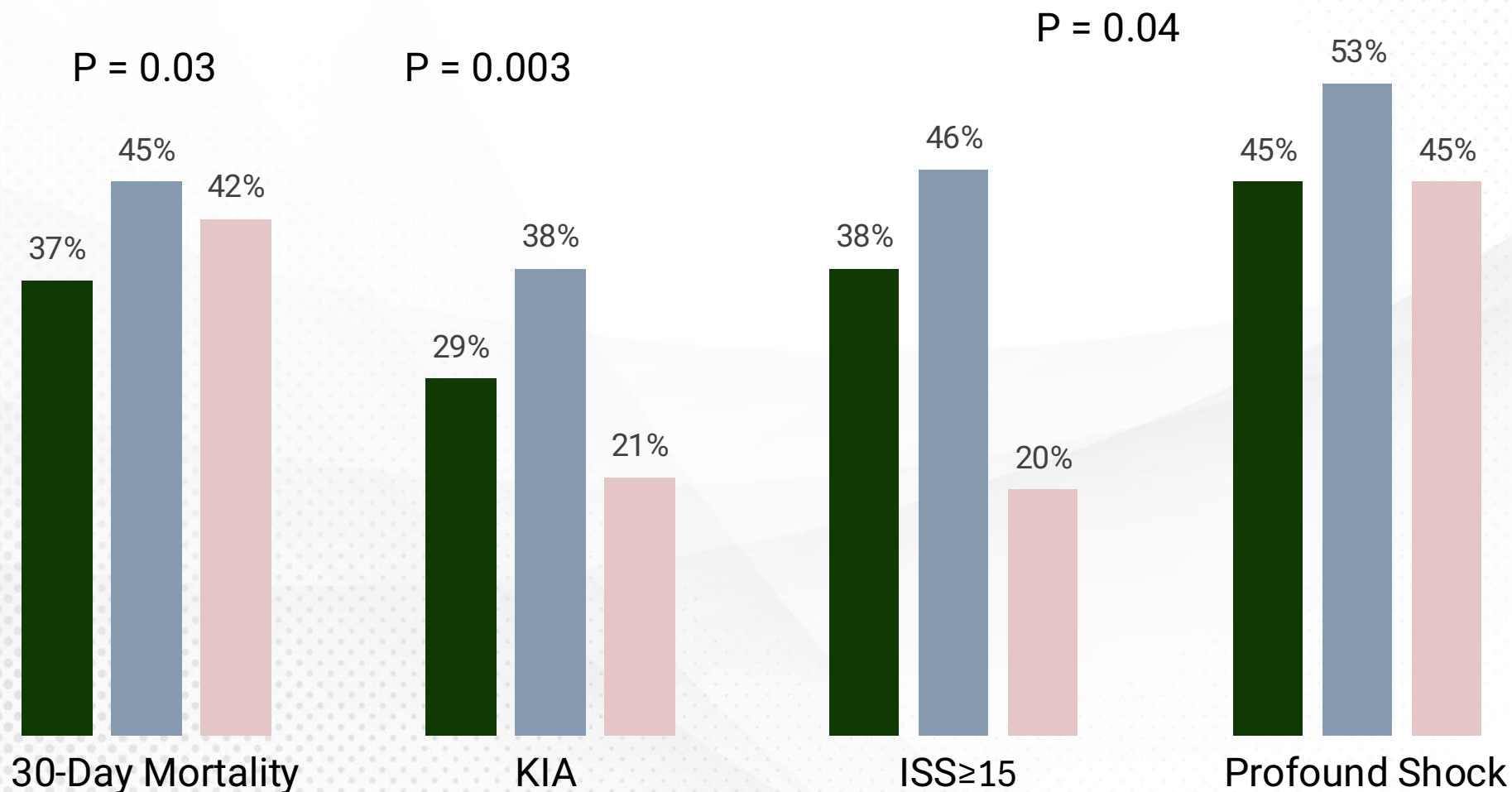


Injury Severity

N=33 Isolated major junctional hemorrhage

N=340 Major junctional hemorrhage

N=1034 Major non-junctional hemorrhage



Conclusions

- Penetrating junctional injury was relatively common in this wartime cohort and was frequently associated with major bleeding, profound shock, and increased mortality
- The findings also suggest important treatment gaps, supporting the need for focused provider training in the early recognition and management of junctional hemorrhage



Thank you!

