

Top 10 Tips to Avoid Trouble with Tourniquets

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EMS State of the Science

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Beware of the Tourniquet!

- “...tourniquets are an invention of the Evil One, and it is no exaggeration to say that many limbs have been lost during this campaign by the indiscriminate use of them.”

-Major Blackwood, Physician, Royal Army Medical Corps, 1916 (WW 1): “Treatment of Wounds from Trench to Field Ambulance”







Should we use tourniquets in civilian EMS?

- They are good for the military
- They are good for the surgeons
- They are good for the patients
- ***So, why not civilian EMS?***

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- *So, why not civilian EMS?*

YES!



Is this a military or civilian injury?

#1: Training / Protocols

Military Use:

- *Every soldier* issued a tourniquet
- Trained to use it (Combat Lifesaver Course)
- Self and Buddy Aid

If they can do it, so can you!

Routine EMS
TOURNIQUET USE Algorithm

**SIGNIFICANT EXTREMITY
BLEEDING WITH NEED FOR
OTHER INTERVENTIONS?**

YES

*Apply tourniquet to
the bleeding limb(s)
on proximal segment*

No

Transport \geq 30 minutes expected

YES

*Reassess tourniquet
for removal*

No

*Leave tourniquet
on and transport*

FIGURE 1

Civilian EMS Tourniquet Use Algorithm

Taillac P and Doyle G: Tourniquet
First! *JEMS*, October 2008 (suppl).

#2: Use a *real* tourniquet

Improvised tourniquets...suck!

- Belt, cravat/stick, twine, etc.
 - Less effective
 - Nerve/muscle injury more likely
 - Sharp edge / Narrow girth
 - Very high pressure needed to occlude arterial flow

#2: Use a *real* tourniquet

Blood Pressure Cuff as Tourniquet

- Safe and can be effective, BUT
- Difficult with mangled / amputated limb
- Not designed to hold high pressures
- You need it to check BP!

Best Tourniquet?

- Combat Application Tourniquet (CAT)
 - Windlass
 - Smaller, lighter
 - Fielded by the military
 - **Best for prehospital**



- Kragh, *Foot Ankle Clin N Am* 2010;15:23
- Taylor, *J Trauma* 2011;71(3):591



Best Tourniquet?

- Emergency and Military Tourniquet (EMT)
 - Pneumatic
 - Wider
 - More comfy
 - Larger/heavier
 - More complicated
 - Best for emergency departments



- Kragh, *Foot Ankle Clin N Am* 2010;15:23
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#3: Use it early

Civilian Prehospital Recommendations:

- Significant extremity hemorrhage with need for other interventions:
 - Apply tourniquet during primary survey
 - Complete A,B,Cs
 - Then when time, hands, supplies available:

Medic may reassess tourniquet for possible replacement with pressure dressing

#3: Use it early

Pressure Dressings

- Excellent, effective **first line treatment** for extremity hemorrhage
- But...to apply well:
 - Takes time
 - Takes hands
 - Takes supplies
- Difficult with mangled extremities or partial / complete amputations

#3: Use it early

Tourniquet provides:

- Rapid (30 seconds or less) hemorrhage control
- THEN, you're freed to continue on to:
 - Other patients (multiple patient scene triage)
 - Other priorities (A,B,C) in a single, multiply-injured trauma patient

#3: Use it early

U.S. Army CSH Baghdad

Kragh, *JEM*
2011;41(6): 590

- **Survival with tourniquet use:**
 - Applied BEFORE patient in shock: 96%
 - Applied AFTER patient in shock: 4%

 - Applied PREHOSPITAL: 89%
 - Applied IN ED: 78%

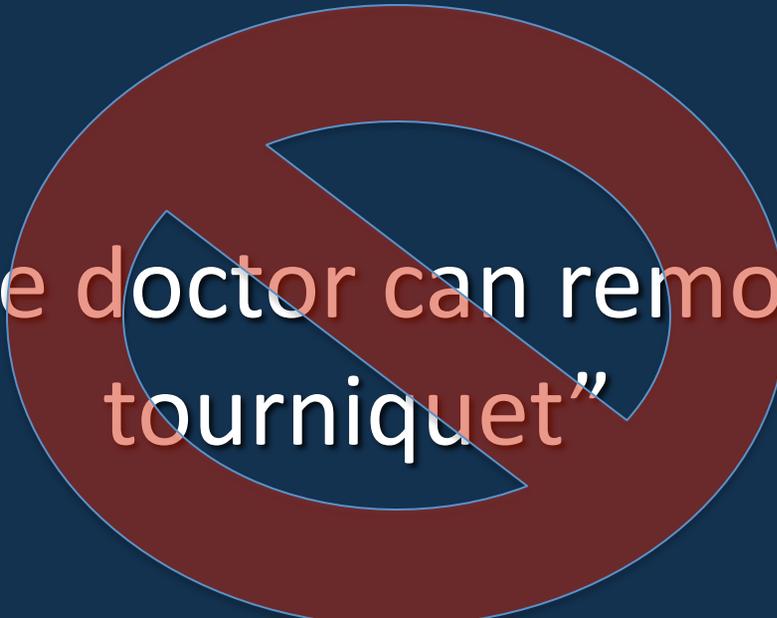
**Much better outcome when tourniquet applied
*prehospital and before shock develops***

#4: Remove it soon (if you can)

“Only the doctor can remove the
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~~“Only the doctor can remove the tourniquet”~~

**60 – 90 minutes clearly safe,
sooner is better**

TOURNIQUET REASSESSMENT Algorithm

PATIENT IN CIRCULATORY SHOCK?

No

YES

Unstable clinical situation?

No

YES

Limited personnel/resources?

No

YES

Proceed to removal algorithm

*Leave
tourniquet
on and
transport
patient
to higher
level of
care*

FIGURE 2

Tourniquet Reassessment (By Medic)

Taillac P and Doyle G: Tourniquet First! *JEMS*, October 2008 (suppl).

TOURNIQUET REMOVAL *Algorithm*

AMPUTATION OR NEAR-AMPUTATION?

No

YES

*Leave
tourniquet
on and
transport
patient
to higher
level of
care*

*Place pressure dressing and loosen
tourniquet (leaving it in place)*

Significant bleeding from site?

No

YES

*Tighten
tourniquet
and
transport
patient
to higher
level of
care*

Further significant bleeding?

No

YES

FIGURE 3

Tourniquet Removal (By Medic!)

Taillac P and Doyle G: Tourniquet
First! *JEMS*, October 2008 (suppl).

#5: Use it effectively

- Apply several centimeters above wound
- Don't apply over joint
- Must completely eliminate distal pulse
 - Avoid the “venous tourniquet”
 - Continued arterial inflow, no venous outflow
 - Increased bleeding
 - Increased edema
 - Increased compartment syndrome



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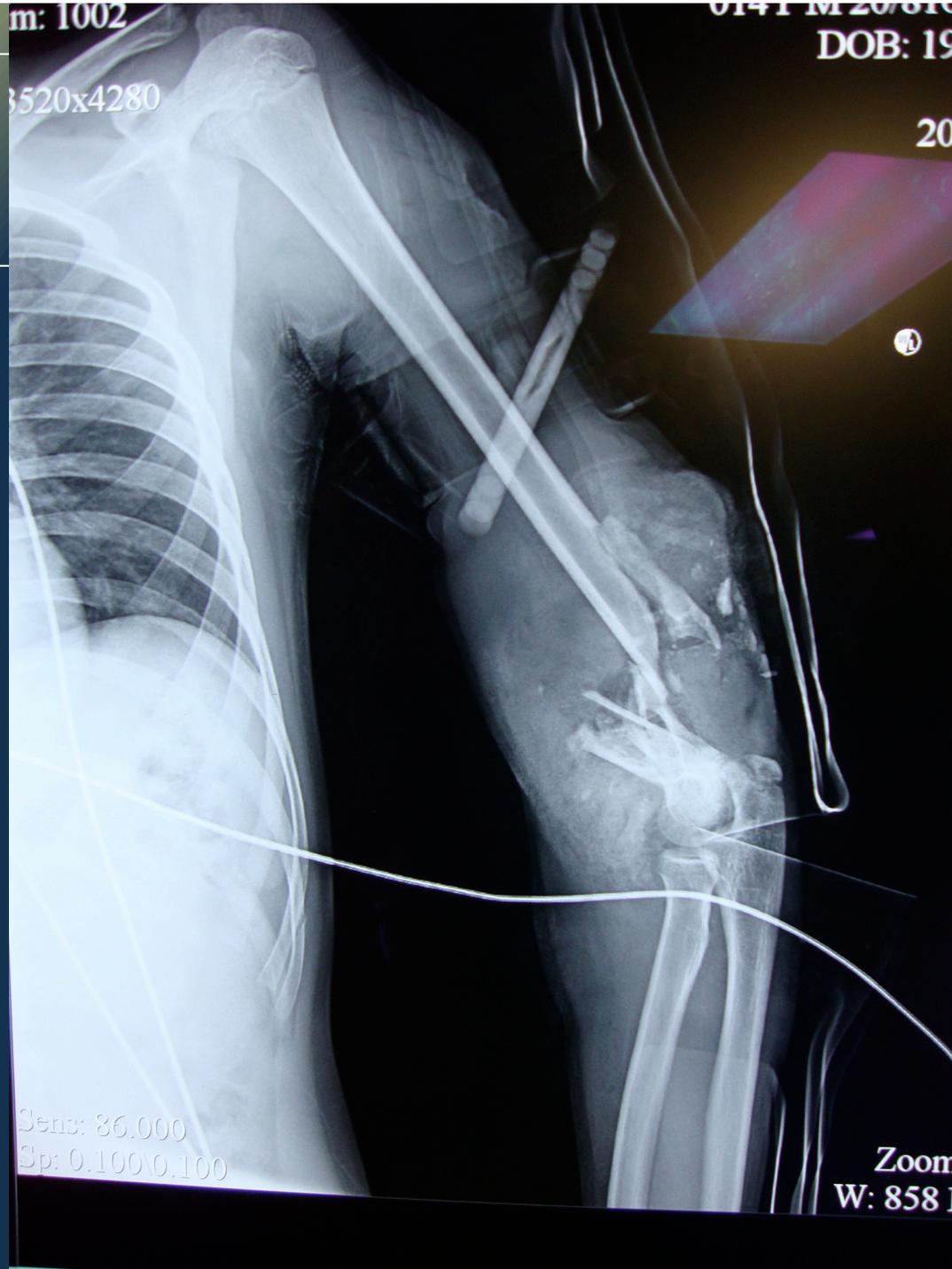
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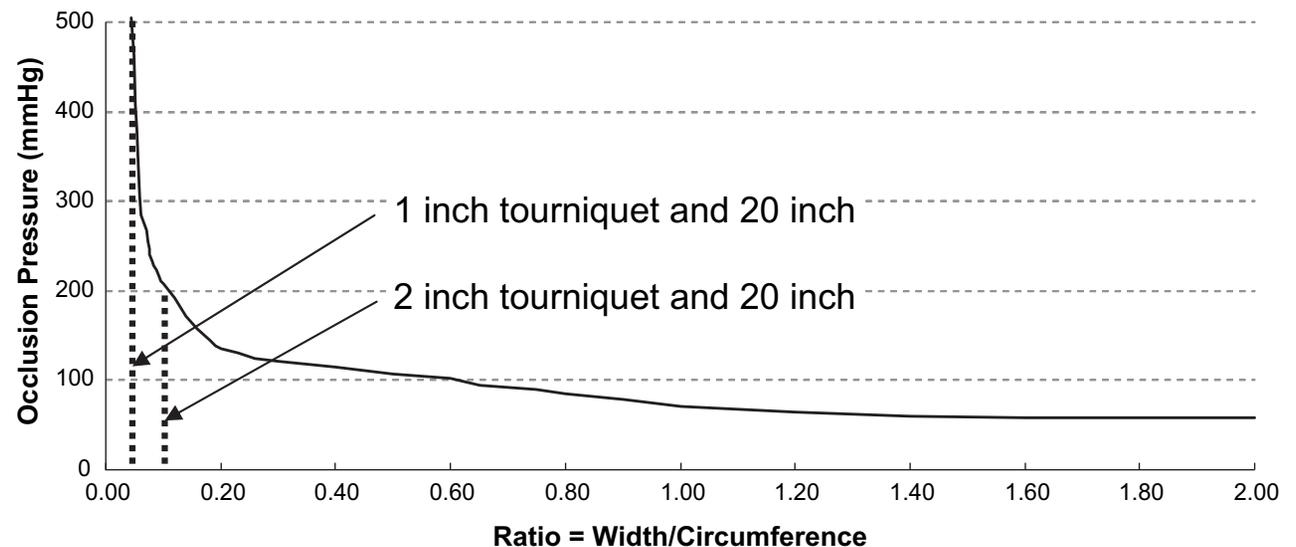
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#6: Width matters

- Wider tourniquets require less force, distributed over a larger surface area, to compress the artery
- Less tissue damage
- Less pain
- Best for thigh use



#7: Two can be better than one

- Placed side by side
- Increased effectiveness from 82% to 92%



Kragh, *J Trauma* 2008;64:S38–50

#8: Use Pain Control

- Tourniquets hurt!
- Morphine, fentanyl, etc.
- Avoid this technique



#9: Make them obvious

- Mark it!
 - Brightly colored cloth
 - Don't cover with clothing
- Sharpie to the patient's forehead
 - Time of application
- Advertise it!
 - Tell the next provider it's there
 - Tell the patient to tell EVERYONE that it's there



07/03/2010

ICU/ICW BED STATUS FACILITATOR: Army

	PAD #	Admit Date	Admit/DX	Ward	Diet	DOC	Nurse
	2329	3 Julm	GSW	1		Cooper	Amenkwa
1.5							
2	2331	3 Julm	RPG - MTBI	ICU	clears	Heitman	Amenkwa
3	2322	2 Jul 10	S/P GRENAGE	ICW	NPO P midnight		James
3.5	2315	30 JUNE	SKULL FX 2° IED BLAST	ICW	REG		Castillo
4	2325	3 Jul 10	GSW Bilateral Knees	ICW	REG		Rondos
5	5217	July 2-10	(+) Leg Cellulitis	ICW	REG	Taillac	Rondos
6	2314	30 JUN	(B) FOOT AMP (R) HAND + (D) KNEE	ICW	REG	PHILLIPS	ROYER
6.5	2327	3 JULY	GSW S/P GASTRIC REPAIR	ICW			Castillo
7	2328	3 JULY	GSW - SHRAPNEL WOUNDS	ICW		HEITMAN	Royer
7.5							
8	2330	3 Julm	RPG Blast injury	ICW		Schenert	James

MAT Kelly
079551501
CPT

#10: Dialysis fistula bleeding

- If direct pressure fails...
- Safest to place very proximally, away from the fistula
- Tighten to effect only
- May result in fistula thrombosis!

Cardiac Remote Preconditioning

- NO soldiers died of a STEMI after receiving tourniquet!

(I was paying attention, Dr. Valenzuela)



Back to the Future...

- The tourniquet is “to be regarded with respect because of the damage it may cause, and with reverence because of the lives it undoubtedly saves. It is not to be used lightly in every case of a bleeding wound, but applied courageously when life is in danger.”

Bailey, H. *Surgery of Modern Warfare*, E&S Livingstone;
Edinburgh, 1941



Lesson learned:
Tourniquets work better on limbs.

Practice
makes
perfect...

Questions?