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Seek and You Shall Find: Is Routine Duplex Ultrasound Screening for Deep Vein Thrombosis in Trauma Warranted?

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Seek and Yee Shall Find. Is Aggressive Ultrasonography Screening for Deep Vein Thrombosis in Trauma Warranted?

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Venous Thromboembolism

- Overall Population
  - 900,000 people/year are diagnosed with VTE
  - 300,000 deaths/year due to VTE[1]
- Trauma patients
  - Incidence of DVT ranges from 5-63%[2]
  - Incidence of PE ranges from 1%-2% (mortality rates as high as 20%-50%)[3]

Duplex Ultrasonography in High Risk Trauma Patients

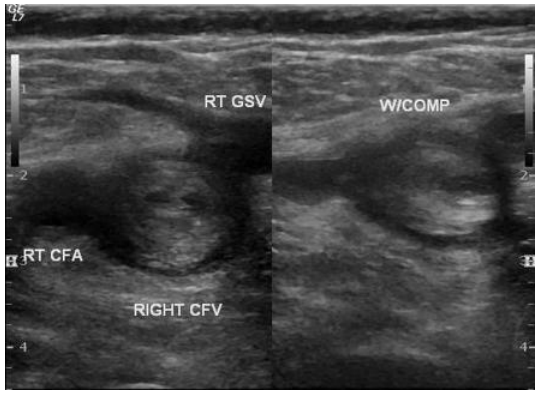
- East Practice Management Guidelines[4]
  - Level I DUS may be used to diagnose symptomatic trauma pts with suspected DVT without confirmatory venography [4]
  - Level III Screening DUS in high-risk trauma patients may be cost effective and may decrease incidence of PE
  - Sensitivity of DUS is low when compared to venography

Duplex Ultrasonography in High Risk Trauma Patients

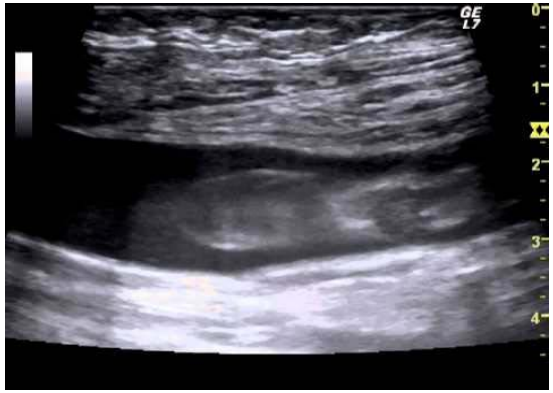
- Ochsner et al, JOT 2008
  - Retrospective review, 2939 critically injured pts over a 4 year period with LOS > 2 days. All pts were high risk for VTE[4].
  - VTE rate of 3.2%, DVT rate 2.5 % and a PE rate of 0.7%
  - 86% of DVT's were found on routine screening

Purpose

To determine if routine duplex ultrasound screening for the detection of deep venous thrombosis is warranted in all trauma patients



Hypothesis



Routine duplex ultrasound screening for the detection of deep venous thrombosis is not warranted in all trauma patients

Methods

- Prospective data collected on 13,111 critically injured patients admitted to a level I trauma center over a 5 year period from 2014-2018
- Data variables
  - Age
  - Gender
  - ISS
  - GCS
  - BMI
  - Routine Duplex Ultrasonography
- Outcomes Variables
  - Mortality
  - Hospital Length of Stay
  - DVT/PE

Statistical Analysis

- Categorical variables were compared using Pearson's Chi square and contingency table analysis
- ANOVA and multiple logistic regression analysis were utilized for binary outcomes
- Continuous variables were compared using Student's t-test and multiple linear regression analysis
- Software: SPSS (IBM Corp. Version 24.0 Released 2016, Armonk, NY)

Patient Demographics

Variable		*n*
Age (years)	45.3 ± 25.0	13113
Male Gender (%)	62.5%	13113
Injury Severity Score	11.3 ± 9.3	12984
Glasgow Coma Score	13.8 ± 3.2	12363
Body Mass Index	26.4 ± 6.5	12495
Hospital Length of Stay (days)	6.5 ± 11.0	12670
Venous Thromboembolism	1.6%	13113
Deep Venous Thrombosis (%)	1.0%	13113
Pulmonary Embolism (%)	0.8%	13113
Mortality	4.9%	13113

Age, ISS, GCS, BMI and HLOS Data presented as Mean ± SD

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Hospital Length of Stay Data presented as Mean ± SD

Patient Demographics

Variable	*2014-2016 N = 7051*	*2017-2018 N = 6062*	*P*
Age (years)	44.5 ± 24.4	46.3 ± 25.7	< 0.0001
Male Gender (%)	64.1%	60.7%	< 0.0001
ISS	12.2 ± 9.4	10.2 ± 9.1	< 0.0001
GCS	13.6 ± 3.4	14.0 ± 3.0	< 0.0001
BMI	26.3 ± 6.4	26.6 ± 7.0	< 0.05
HLOS (days)	7.3 ± 12.7	5.6 ± 8.6	< 0.0001
VTE (%)	2.3 %	0.7%	< 0.0001
DVT (%)	1.6%	0.3%	< 0.0001
PE (%)	1.0%	0.5%	< 0.01
Mortality	5.8%	3.9%	< 0.0001

Age, ISS, GCS, BMI and HLOS Data presented as mean ± SD

Patient Demographics

Variable	*2014-2016 N = 7051*	*2017-2018 N = 6062*	*P*
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Age, ISS, GCS, BMI Data presented as Mean ± SD

Patient Demographics

Variable	*2014-2016 N = 7051*	*2017-2018 N = 6062*	*P*
HLOS (days)	7.3 ± 12.7	5.6 ± 8.6	< 0.0001
VTE (%)	2.3 %	0.7%	< 0.0001
DVT (%)	1.6%	0.3%	< 0.0001
PE (%)	1.0%	0.5%	< 0.01
Mortality	5.8%	3.9%	< 0.0001

Hospital Length of Stay Data presented as Mean ± SD

Risks Factors for Mortality

Variable	*Odds Ratio*	*95% CI*	*P*
Age	1.04	1.03 -1.04	< 0.001
Male Gender	1.51	1.17 - 1.96	< 0.01
Injury Severity	1.08	1.07 – 1.09	< 0.001
Glasgow Coma Score	0.73	0.71 – 0.74	< 0.001
Body Mass index	1.01	0.99 – 1.03	NS
Deep Venous Thrombosis	13.28	3.77 – 46.84	< 0.001
Pulmonary Embolus	0.89	0.31 – 2.56	NS
RDUS	1.37	1.08 – 1.73	< 0.05

Logistic Regression Analysis,

RDUS – Routine Duplex Ultrasonography

Risks Factors for Venous Thromboembolism

Variable	*Odds Ratio*	*95% CI*	*P*
Age	1.01	1.00 -1.02	< 0.01
Male Gender	0.76	0.55 – 1.05	NS
Injury Severity	1.06	1.05 – 1.07	< 0.001
Glasgow Coma Score	1.01	0.97 – 1.05	NS
Body Mass index	1.07	1.05 – 1.09	< 0.001
RDUS	1.27	1.19 – 1.40	< 0.001

Logistic Regression Analysis,

RDUS – Routine Duplex Ultrasonography

Risks Factors for Hospital Length of Stay

Variable	*Coef, SE*	*P*
Age	0.03, 0.01	< 0.0001
Male Gender	0.64, 0.33	NS
Injury Severity	0.33, 0.02	< 0.0001
Glasgow Coma Score	-0.15, 0.05	< 0.01
Body Mass index	0.06, 0.03	< 0.05
Deep Venous Thrombosis	17.74, 1.14	< 0.0001
Pulmonary Embolus	11.67, 1.48	< 0.0001
RDUS	1.50, 4.21	NS

Linear Regression Analysis,

RDUS – Routine Duplex Ultrasonography

Conclusion

- RDUS is a significant risk factor for the identification of DVT in trauma but is not a significant risk factor in improving resource utilization [4]
- RDUS may not be warranted in all trauma patients
- Further studies are needed to determine if routine RDUS is beneficial in decreasing morbidity and mortality in trauma

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