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Not Just Full of Hot Air: Hyperbaric Oxygen Therapy Increases Survival in Cases of Necrotizing Soft Tissue Infections

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Et al.

NOT JUST FULL OF HOT AIR: HYPERBARIC OXYGEN THERAPY INCREASES SURVIVAL IN CASES OF NECROTIZING SOFT TISSUE INFECTIONS

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INTRODUCTION: The utility of hyperbaric oxygen therapy (HBOT) in the treatment for necrotizing soft tissue infections (NSTI) has not been proven. Previous studies have been subject to significant selection bias since HBOT is not universally available at all medical centers and there is often considerable delay associated with its initiation. We examined the utility of HBOT for the treatment of NSTI in the modern era by isolating centers that have their own HBOT facilities.

METHODS: We queried all centers in the University Health Consortium (UHC) database from 2008 to 2010 that have their own HBOT facilities (N=14). Cases of NSTI were identified by ICD-9 diagnosis codes, which included Fournier's gangrene (608.83), necrotizing fascitis (728.86), and gas gangrene (040.0). HBOT treatment status was identified by the presence (HBOT) or absence (CONTROL) of ICD-9 procedure code (93.95). We then risk stratified and matched our cohort by UHC's validated severity of illness (SOI) score. Comparisons were then made using univariate tests of association and multivariable logistic regression.

RESULTS: There were 1,583 NSTI cases at the 14 HBOT-capable centers. 117 (7%) cases were treated with HBOT. Risk stratified univariate outcomes are summarized in the table. There was no difference between HBOT and CONTROL groups in hospital length of stay (LOS), direct cost, complications, and mortality across the three less severe SOI classes (minor, moderate, and major). However, for extreme SOI the HBOT group had fewer complications (45% vs. 66%; $p<0.01$) and fewer deaths (4% vs. 23%; <0.01) while there were no differences in LOS and cost. Multivariable analysis identified age (OR 0.55; 95% CI 0.44 – 0.68) and SOI (OR 0.29; 95% CI 0.21 – 0.40) as independent predictors of survival. HBOT increased the odds of surviving the index hospitalization (OR 8.8; CI 95% 4.4 – 20.4).

CONCLUSION: At HBOT capable centers, receiving HBOT was associated with a significant survival benefit. HBOT in conjunction with current practices for the treatment of NSTI can be both a cost effective and life saving therapy.

Figure 1: Univariate Outcomes by Severity of Illness			
Treatment Status	**HBOT (+)**	**HBOT (-)**	**P-value**
Severity of Illness: MINOR			
	N=4	**N=76**	
Length of Stay (median days)	12	6	0.480
ICU Length of Stay (median days)	2	0	0.105
Hospital Direct Cost (mean)	$22,105	$10,516	0.316
At least 1 complication	50%	14%	0.122
In-hospital Mortality	<1%	2.5%	0.900
Severity of Illness: MODERATE			
	N=20	**N=169**	
Length of Stay (median days)	13	10	0.510
ICU Length of Stay (median days)	7	1	0.024*
Hospital Direct Cost (mean)	$27,578	$18,694	0.120
At least 1 complication	55%	43%	0.348
In-hospital Mortality	17.6%	4.9%	0.115
Severity of Illness: MAJOR			
	N=44	**N=642**	
Length of Stay (median days)	14	13	0.68
ICU Length of Stay (median days)	7	3	0.024*
Hospital Direct Cost (mean)	$29,005	$24,517	0.088
At least 1 complication	41%	54%	0.117
In-hospital Mortality	2.3%	5.9%	0.376
Severity of Illness: EXTREME			
	N=49	**N=579**	
Length of Stay (median days)	23	19	0.147
ICU Length of Stay (median days)	13	8	0.091
Hospital Direct Cost (mean)	$58,382	$42,635	0.156
At least 1 complication	45%	66%	0.004*
In-hospital Mortality	4.2%	23%	<0.01*