Pressure Applied by the Emergency/Israeli Bandage

CAPT Nolan Shipman, USN (Ret.)*; Lt Col Charles S. Lessard, USAF (Ret.)†

ABSTRACT The primary objective of the study was to determine the amount of pressure exerted by a bandage modified with a "pressure bar." The data were collected using Emergency Bandages with and without the pressure bar. In addition to measuring the pressure under the pressure bar, other pressure sensors were used to measure the pressure being exerted to other areas under the elastic Emergency Bandage (at 90°, 180°, and 270°), but not directly under the pressure bar to determine the effectiveness of the pressure bar bandage to apply localized pressure over a wound without applying unnecessary pressure over the other areas. Two sets of statistical tests conducted: " *t*-tests" assuming unequal variances from two samples and the "analysis of variance" (ANOVA), single factor. From the results, it is concluded that the Emergency Bandage pressure bar is very effective in elevating the applied pressure directly under the pressure bar while at the same time not applying unnecessary pressure over other areas covered by the bandage, which allows control of hemorrhage at the site of injury (under the pressure bar area) without having to have a full tourniquet effect. Perfusion of the capillaries of the hand and fingers were found to be adequate by observation of the fingers tips (finger nail quick) and subjective pulse measurement at the wrist (radial artery).

INTRODUCTION

At the request of Performance Systems (3050 Post Oak Blvd., Suite 1710, Houston, Texas 77056), this study was undertaken to quantify the pressure that the Emergency Bandage applies around a cylindrical object, i.e., a simulated arm (4 inches inner diameter with 4.5 inches outer diameter PVC pipe) or a thigh. Pressure tests were performed on a simulated arm and on 10 subjects (males and females) around the arm. The primary objective of the study was to determine the amount of pressure exerted by a bandage modified with a "pressure bar." The data were collected using Emergency Bandages with and without the pressure bar. In addition to measuring the pressure under the pressure bar, other pressure sensors were used to measure the pressure being exerted to other areas under the elastic Emergency Bandage (at 90°, 180°, and 270°), but not directly under the pressure bar to determine the effectiveness of the pressure bar bandage to apply localized pressure over a wound without applying unnecessary pressure over the other areas.

BACKGROUND

The most common cause of preventable deaths on the battlefield in Vietnam was exsanguinations from extremity wounds.[1] The 1996 and 2006 Tactical Combat Casualty Care (TCCC) guidelines "...advocated the aggressive use of tourniquets to control bleeding" (Butler et al.).[2] The first step in managing seriously wounded casualties is to control the hemorrhage as much as possible. The first approach for hemorrhage control continues to be direct pressure on the bleeding site.[3] The Emergency Bandage studied can both place much higher pressure on the bleeding site and also produce a tourniquet-like effect at the bleeding site.

The Emergency Bandage, manufacture by First Care Products Ltd., Lod, Israel, is designed to increase the pressure under the pressure applicator (pressure bar) with support for the closure bar to maintain the pressure to a wound (under the pressure bar) while securing the bandage. The bandage is similar to any elastic bandage used for wrapping sprained ankles, knees, elbows, or wrists except for three special purpose components that have been added to the elastic wrap. The three special purpose components include: the dressing, the pressure applicator or pressure bar, and the closure bar. The dressing is a sterile (vacuum-packed) nonadhering dressing that allows removal of the bandage without reopening the wound. The pressure applicator improves tightness and provides greater pressure under the pressure applicator (site of the wound) to stop bleeding. The closure bar secures the bandage with a simple sliding motion with one hand. Additionally, the closure bar may be used to create additional pressure to the area (help stop bleeding) by sliding the closure bar under a surface dressing layer and twisting the bandage wrapping.

The bandages are provided in various sizes: 4-inches wide, 6-inches wide, and 8-inches wide. Only the 6-inch-wide Emergency Bandages (FCP-02 Military [NSN no. 6510-01-492-2275]) were used on volunteer subjects. The 6-inch-wide, all-in-one device consolidates multiple first-aid devices such as a primary dressing, pressure applicator, secondary dressing, and a foolproof closure apparatus to secure the bandage in place. The internationally patented and FDA approved Emergency Bandage is especially ideal for emergency treatment. The Emergency Bandage's sterile, nonadherent pad applies pressure to any site, can be easily wrapped and secured, and has an additional application, similar to a tourniquet, to further constrict blood flow. All of the Emergency Bandages used for testing arrived in individually sealed, vacuum-sterile packages.

*Clinical Assistant Professor, College of Medicine, Texas A&M University, 3201 University Drive East Suite 375, Bryan, TX 77802.

†Biomedical Engineering Department, Texas A&M University, College Station, TX 77843.

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METHOD

This section describes the test equipment used in the tests, subject procedures, and the statistical procedures. All tests were conducted at the Physician's Centre Hospital in Bryan, Texas.

Equipment and Setup

Four LoadStar "iLoad Mini-10 Lb" (P/N FP-C-010-050), 0.5% accuracy miniature load cells were placed equally spaced around the arms. The load cells are specified to handle up to a maximum load of 50 Lb. The pressure sensing head on the load cell sensor had a diameter of 0.40 inches, which equates to a cross-sectional area of 0.125664 square inches. The load cell was connected to a LoadStar "Freq to USB Convertor" (P/N DQ-1000), through a mini-USB cable to a Dell Inspiron notebook computer. All the load cells were calibrated by the company and are National Institute of Standards and Technology (NIST) traceable. The LoadStar program, "LoadVUE Software" (P/N LV-2000), was used to acquire and download the data from the four load cells (sensors) in a spreadsheet format for subsequent analyses.

Subjects

Ten healthy male and female volunteers were selected for the bandage's compliant surface tests (soft tissue). These 10 healthy young subjects were chosen as representatives of medics and soldiers that might be on the battlefield. They were trained in the use of the Emergency Bandage by didactic lecture, training video from First Care Products, and 1 hour of hands-on practice.

Four (4) load cells (sensors) purchased from LoadStar, Inc., California were equally spaced around the subject's right upper arm. Sensor 1 was placed midway between the shoulder and the elbow anteriorly, with sensor 2 midway between the shoulder and elbow medially; sensor 3 was placed midway between the shoulder and elbow posteriorly (triceps), with sensor 4 midway between the shoulder and elbow laterally.

The pressure bar was placed above the load cell (sensor 1) on the bicep so that the pressure exerted by the wrapped pressure bar would be measured independently of other areas under the bandage that were not under the pressure bar. The other three load cells (sensors 2, 3, and 4) were placed about the circumference of the arm or pipe at 90°, 180°, and 270° from sensor 1. The bandage was applied in <1 minute; then the program was started to collect 30 seconds of data. The bandage was removed and the subject was permitted to rest for 5 minutes before the next run. During each run, the subject's fingers and pulse at the wrist (radial artery) were observed to check for the hand capillary bed perfusion.

Test Runs

The first set of tests run were the "static" tests on a 4-inch inner diameter with a 4.5-inch outer diameter PVC tube that was mounted on a rigid stand, simulating an upper arm. The static tests were followed by the subject testing at the hospital. The general category of test runs are:

1. Static noncompliant tests without the pressure bar.
2. Static noncompliant tests with the pressure bar.
3. Compliant (subject) tests without the pressure bar.
4. Compliant (subject) tests with the pressure bar.

The first set of tests involved using only the closure bar: applying the Emergency Bandage without the pressure bar. Additional test runs were conducted by applying twists to a previous wrap with the closure bar. Different pressures result depending on how many times the bandage is twisted with the closure bar and fastened. The various test runs were conducted with both the static noncompliant PVC and the subject (compliance) tests. The second set of tests involved the application of an Emergency Bandage with a pressure bar and by tightening the bandage after changing directions over the pressure applicator. At the same time, the pressure applied by the elasticity of the dressing to other parts of the arm were measured to make sure that the major application of pressure is isolated to the pressure bar applicator. The closure bar can be fastened wherever possible without twisting. Additional tests were conducted by applying twists to a previous wrap with the closure bar. The increase of pressure resulting from twisting the Emergency Bandage with the closure bar was recorded and presented in the results section.

Analysis

The pressure results from all four sensor positions are placed in a data table for each case. The results from the compliant and noncompliant tests will be compared statistically and graphically. The statistical analysis consisted of standard deviation, mean value, and pressure distribution values compared between test cases. Tests of the means (*t*-tests assuming uneven variances) were conducted using the averages of pressure measured at sensor 1 under two test run conditions.

The null hypothesis for this test is stated as follows: "The mean pressure measured at sensor 1 (located under the pressure bar) for test run category 3 is statistically the same as the mean pressure measured at sensor 1 for test run category 4."

Analysis of variance (ANOVA) was used in tests of mean pressure measured at sensor 1 (located under the pressure bar) comparison to the mean pressures measured at sensors 2, 3, and 4 (located about the circumference of the arm at 90°, 180° and 270° from sensor 1). The null hypothesis for the ANOVA test is stated as follows: "The mean pressure measured at sensor 1 (located under the pressure bar) is statistically the same as the mean pressures measured at sensors 2, 3, and 4 for test run category 4."

RESULTS AND DISCUSSION

Results of the tests are presented in the following order:

1. Static tests with 4-inch Emergency Bandage applied to simulated arm.

2. Static tests with 6-inch Emergency Bandage applied to simulated arm.
3. Subject tests with 6-inch Emergency Bandage applied to right arm.

The following test runs were conducted with the 4-inch Emergency Bandage:

1. 4-inch Emergency Bandage without the pressure bar and no twisting with closure bar.
2. 4-inch Emergency Bandage without the pressure bar and 2 twists with closure bar.
3. 4-inch Emergency Bandage without the pressure bar and 3 twists with closure bar.
4. 4-inch Emergency Bandage with the pressure bar and no twisting with closure bar.
5. 4-inch Emergency Bandage with the pressure bar and 2 twists with closure bar.
6. 4-inch Emergency Bandage with the pressure bar and 3 twists with closure bar.
7. 4-inch Emergency Bandage with the pressure bar and 4 twists with closure bar.
8. 4-inch Emergency Bandage with the pressure bar and 5 twists with closure bar.
9. 4-inch Emergency Bandage with the pressure bar and 6 twists with closure bar.

A summary of the average (mean) pressures of the static test runs conducted with the 4-inch Emergency Bandage are displayed in a graphical bar chart (Fig. 1). The primary sensor 1, shown as the red bar on the graph, was located under the pressure bar and/or twisted knot. The tests with the 4-inch Emergency Bandage provided a valuable insight into the effects of the twisted knot not being directly over the sensor or wound (the desired location). This effect is noted with the decrease in the applied average pressure if the twist knot and closure bar are before or after the area of interest (directly over sensor 1). If the twisted knot is not directly over the sensor or wound (the desired location), less pressure is applied at the desired location. The 4-inch bandage with the pressure bar showed that twisting the bandage with the closure bar approximately doubled the applied pressure on sensor 1. It should be noted in Figure 1 that the pressures applied to others areas (sensor 2, sensor 3, and sensor 4) are generally <5 PSI, indicating that the Emergency Bandage exerts its major pressure under the pressure bar and/or the twisted knot.

The static test runs conducted with the 6-inch Emergency Bandage are as follows:

1. 6-inch Emergency Bandage without the pressure bar and no twisting with closure bar.
2. 6-inch Emergency Bandage without the pressure bar and 3 twists with closure bar.
3. 6-inch Emergency Bandage without the pressure bar and 4 twists with closure bar.
4. 6-inch Emergency Bandage with the pressure bar and no twisting with closure bar.

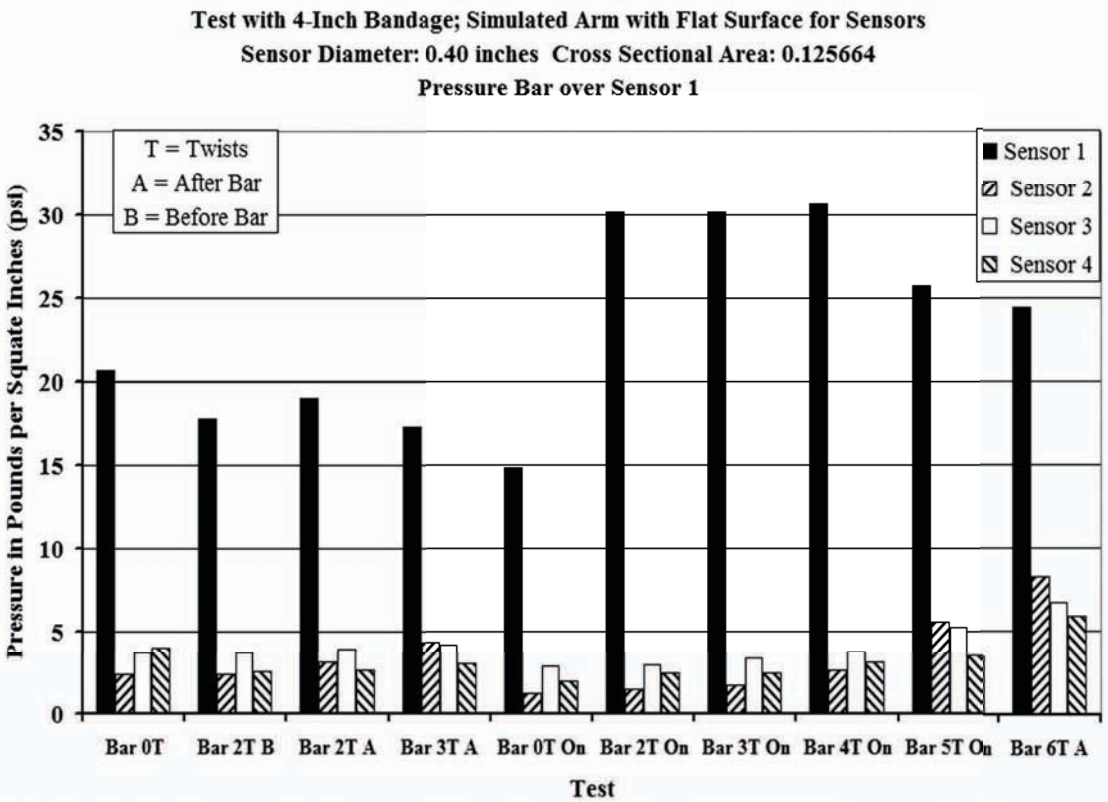

FIGURE 1. Bar chart showing the average (mean) pressures of the static test runs conducted with the 4-inch Emergency Bancage.

5. 6-inch Emergency Bandage with the pressure bar and 3 twists with closure bar.
6. 6-inch Emergency Bandage with the pressure bar and 4 twists with closure bar.

A summary of the averages (mean) and standard deviation of the six static test runs conducted with the 6-inch Emergency Bandage are given in Table I.

To insure at least 30 PSI of pressure requires at least 4 twists of the Emergency Bandage directly above the wound area. The large variation in the pressure measurement can be explained partly on the individual applying the Emergency Bandage (perhaps, not pulling the elastic stretch bandage as taut) and partly on the location of the twisted knot and the closure bar. If the twisted knot was not directly over the sensor or wound (the desired location), less pressure is applied at the desired location.

With the pressure bar the measured pressures at the desired location (sensor 1 or wound) did not change significantly. The effects of the twisted knot not being directly over the sensor or wound were noted as a decrease in the average pressure being applied at the desired location with 3 twists. Nevertheless, all test cases with the pressure bar exceeded 30 PSI. The application of 4 twists over the pressure bar would appear to be excessive.

The single factor analysis of variance (ANOVA) test of the 6-inch Emergency Bandage without the pressure bar indicated statistical significant differences (P value = 0.00166) between the mean pressure applied at the site of interest (sensor 1) and the adjacent areas (sensor 2, sensor 3, and sensor 4). Additionally, the single factor analysis of variance (ANOVA) test of the 6-inch Emergency Bandage with the pressure bar indicated statistical significant differences (P value = 1.9E-07; much less than 0.0001) between the mean pressure applied at the site of interest (sensor 1) and the adjacent areas (sensor 2, sensor 3, and sensor 4). From these results it is concluded that the Emergency Bandage when applied to produce sufficient pressure to stop the bleeding of a penetrating wound does not act like a tourniquet.

TABLE I. Summary Results of the 6-Inch Emergency Bandage Without Twisting with the Closure Bar (Means and Standard Deviations in PSI)

	Pressure in Pounds per Square Inch			
Test Run	Sensor 1	Sensor 2	Sensor 3	Sensor 4
AVG run 1	15.71	6.03	6.74	8.78
STD run 1	0.52	2.6	1.16	3.32
AVG run 2	24.49	4.35	6.68	7.39
STD run 2	0.97	6.15	1.28	3.38
AVG run 3	30.62	8	7.02	9.45
STD run 3	11.61	4.01	1.27	1.9
AVG run 4	39.36	8.05	5.86	7.25
STD run 4	5.08	0.9	0.32	2.89
AVG run 5	35.05	5.15	5.61	3.71
STD run 5	4.93	2.78	0.64	1.11
AVG run 5	42.7	8.01	6.29	5.48
STD run 6	7.93	3.33	0.67	2.22

Results from Subject Tests

The following subject test runs were conducted with the 6-inch Emergency Bandage applied to the subject's right arm.

1. 6-inch Emergency Bandage without the pressure bar and no twisting with closure bar.
2. 6-inch Emergency Bandage without the pressure bar and 2 twists with closure bar.
3. 6-inch Emergency Bandage with the pressure bar and no twisting with closure bar.
4. 6-inch Emergency Bandage with the pressure bar and 2 twists with closure bar.

The second through the fifth columns in Table II present the pressures (PSI) recorded at each sensor when the 6-inch Emergency Bandage was applied without the pressure bar and not twisting the bandage over sensor 1 with the closure bar. Even though it appears as if all the pressure readings are almost the same, the one factor analysis of variance indicated significant statistical differences with a P value = 0.0137.

The last 4 columns in Table II present the pressures (PSI) recorded at each sensor when the 6-inch Emergency Bandage was applied without the pressure bar and not twisting the bandage over sensor 1 with the closure bar. It should be noted that the pressures in the areas not under the pressure bar (sensors 2, 3, and 4) are about one-third of the pressure under the pressure bar (sensor 1: AVG = 30.08 and STD = 7.67). The mean and standard deviation for sensors 2, 3, and 4 are AVG = 10.82 and STD = 3.40.

The summary of the averages (mean) and standard deviation of the applied pressure at the site of interest (sensor 1) for the subject test runs conducted with the 6-inch Emergency Bandage are given in Table III.

Statistical Analysis

Two sets of statistical tests were used on the subject data without twists as shown in Table II; similar data sets were obtained from the application with 2 twists. From Table III, it was noted that 2 twists over the pressure bar (PB2T) were sufficient to exceed the target applied pressure of 30 ψ; hence it was decided not to continue with higher twist runs.

The first statistical tests conducted were "t-tests" assuming unequal variances from two samples. The second set of statistical tests conducted were the "analysis of variance," single factor ANOVA.

A summary of results from the t-tests for two-sample assuming unequal variances are given in Table IV. Note that there is no significant statistical difference in subject runs without the pressure bar between the "no twist" (NB0T) and the "2 twists" (NB2T) condition (first row of test variables). Significant statistical difference was found in subject runs between conditions "without the pressure bar and no twist" (NB0T) and the "pressure bar with no twist" (PB0T—third row of test variables).

TABLE II. Average Results within Subjects, No Twists with Closure Bar

Average in: Pressure in Pounds per Square Inch (PSI)								
	Without Pressure Bar				With Pressure Bar			
	Sensor				Sensor			
Subject	1	2	3	4	1	2	3	4
1	14.24	7.96	-	14.31	23.63	13.34	-	13.89
2	13.16	5.69	8.83	9.49	31.41	5.96	11.22	12.52
3	18.93	7.75	10.92	16.67	35.71	10.8	13.31	16.31
4	15.3	7.62	10.13	15.87	30.61	9.88	10.32	15.29
5	9.8	4.34	5.67	9.63	29.03	11.08	9.4	11.07
6	12.28	5.24	11.02	11.26				
7	6.22	3.74	4.34	4.7	22.48	5.85	7.77	11.98
8	6.21	6.95	4.45	2.04	22.7	8.04	3.91	5.6
9	8.39	5.31	4.53	6.7	45.03	15.64	14.38	12.09
10	8.06	7.17	3.53	6.96				
Overall average	11.26	6.18	7.05	9.76	30.08	10.07	10.05	12.35
Overall std dev	4.22	1.51	3.13	4.84	7.67	3.43	3.51	3.26

TABLE III. Averages and Standard Deviation of Subject Tests

	Sensor 1	
Test	Mean	Std Dev
NB0T	11.2582742	4.21917234
NB2T	14.181599	2.68106317
PB0T	30.0752801	7.6737861
PB2T	40.3853057	7.28907335

Single-Factor ANOVA Tests

Single-factor ANOVA tests were conducted to test the two null hypotheses:

1. There is no statistical difference between pressure readings when the pressure bar is applied and pressure readings when the pressure bar is not applied.
2. There is no difference between the pressure at the site under the pressure bar when the bar is applied and the pressures at sites not under the pressure bar when the bar is applied.

The tests were conducted with the average pressures shown in Table V. The pressure in rows 1 and 3 are the overall averages that are shown in the next to last row of Table II, respectively.

The results of the ANOVA tests are shown in Table VI. The results indicate that the pooled row pressures are not statistically significant for the conditions without a pressure bar. However, since the primary interest is in determining if the pressure applied by the pressure bar (above sensor 1) is greater than the bandage without the pressure bar, analysis by column sum (sensors) is the better approach. Test 4 (Table VI), the test between pressure bar and no pressure bar with no twisting, shows that there is a significant statistical difference. Hence, the first null hypothesis that there is no statistical difference between pressure readings when the pressure bar is applied and pressure readings when the pressure bar is not applied is rejected in favor of the alternate hypothesis that there is a significant statistical difference.

TABLE IV. Summary of *t*-Test Results

t-Test: Two-Sample Assuming Unequal Variances Significance level $\alpha = 0.05$					
Test Variables	Degrees of Freedom (df)	$P(T <= t)$ One-Tail		$P(T <= t)$ Two-Tail	
NB0T vs. NB2T	14	0.0562	No sig dif	0.1124	No sig dif
NB2T vs. PB2T	5	0.0003	Sig dif	0.0006	Sig dif
NB0T vs. PB0T	10	>0.0001	Sig dif	0.0001	Sig dif
PB0T vs. PB2T	9	0.0190	Sig dif	0.0379	Sig dif
NB2T vs. PB0T	9	0.0002	Sig dif	0.0004	Sig dif

TABLE V. Average Pressures Applied at the Sensors for the Four Subject Test Conditions

		Col 1	Col 2	Col 3	Col 4
		Sensor 1	Sensor 2	Sensor 3	Sensor 4
Row 1	NB0T	11.258274	6.17732377	7.04616833	9.76301858
Row 2	NB2T	14.181599	6.6047429	7.26602089	11.4158619
Row 3	PB0T	30.07528	10.0730715	10.0462602	12.345414
Row 4	PB2T	40.385306	15.0467532	12.0348325	13.5092895

TABLE VI. Summary of Subject Results Test 4

ANOVA: Single Factor Significance Level $\alpha = 0.05$				
Test Variables	Test No.	By	*P* value	Results
NB0T vs. NB2T	1	Rows	0.565	No sig dif
NB0T vs. NB2T vs. PB0T vs. PB2T	2	Rows	0.244	No sig dif
NB0T vs. NB2T	3	Cols	0.0175	Sig dif
PB0T vs. NB0T	4	Cols	<0.0001	Sig dif
NB0T vs. NB2T vs. PB0T vs. PB2T	5	Cols	0.0425	Sig dif

ANOVA test 5 results, shown in Table VII, indicate that there are significant statistical differences between the pressures applied under sensor 1 and the other adjacent sensors (sensor 2, 3, and 4). Hence, the second null hypothesis that there is no difference between the pressure at the site under the pressure bar when the bar is applied and the pressures at sites not under the pressure bar when the bar is applied is rejected in favor of the alternate hypothesis that there is a significant statistical difference.

To verify that the Emergency Bandage applied about the same amount of pressure to areas not under the pressure bar (adjacent secondary sensors 2, 3, and 4), a separate ANOVA test of only the pressure under the three secondary sensors was conducted. The ANOVA results indicated no significant statistical difference (P value = 0.408) in the pressures applied by the Emergency Bandage to the areas under sensors 2, 3, and 4.

DISCUSSION

The Emergency Bandage (AKA the Israeli Bandage), the focus of this study, has been the bandage of choice for the U.S. Army and the Special Forces for >7 years. It is utilized in all levels of medical care and is to be carried in the individual first aid kit (IFAK) of every army soldier. It is also used by the Air Force and Marines. This Emergency Bandage has been used during Operation Enduring Freedom and Operation Iraqi Freedom as well as other conflicts worldwide. (Williams D. May, personal communication, 2008)

The primary objective of the study was to determine the amount of pressure exerted by the bandage with a modification called the "pressure bar." The data were collected using Emergency Bandages with and without the pressure bar. In addition to measuring the pressure under the pressure bar, other pressure sensors were used to measure the amount of pressure being exerted to other areas under the elastic Emergency Bandage, but not directly under the pressure bar. A secondary objective of the study was to quantify the distribution of pressure that the Emergency Bandage applied to determine the effective ability of the Emergency Bandage to apply localized pressure with the pressure bar over a wound without applying unnecessary pressure over other areas.

TABLE VII. Test 5 ANOVA Summary

	ANOVA: Single Factor 4 Columns, All 4 Rows NB0T vs. NB2T vs. PB0T vs. PB2T					
	Groups	Count	Sum	Average	Variance	
Sensor 1	Column 1	4	95.901	23.975	188.046	
Sensor 2	Column 2	4	37.902	9.475	16.838	
Sensor 3	Column 3	4	36.393	9.098	5.697	
Sensor 4	Column 4	4	47.034	11.758	2.503	
Source of variation	SS	df	MS	F	*P* value	F crit
Between groups	593.237	3	197.746	3.712	0.042	3.490
Within groups	639.252	12	53.271		Sig Dif	
Total	1232.489	15				

From the results, it is concluded that the Emergency Bandage pressure bar is very effective in elevating the applied pressure directly under the pressure bar while at the same time not applying unnecessary pressure over other areas covered by the bandage, which allows control of hemorrhage at the site of injury (under the pressure bar area) without having to have a full tourniquet effect. The Emergency Bandage may perform as a pressure dressing over the site of injury and be tightened to incrementally decrease blood flow to the extremity in a similar fashion as a tourniquet.

Perfusion of the capillaries of the hand and fingers were found to be adequate by observation of the fingers tips (finger nail quick) and subjective pulse measurement at the wrist (radial artery). Satpathy in his article on measuring subbandage pressures stated, "There was no correlation between the pressure monitors and the pulse oximeter pressures, demonstrating that the pulse oximeter is not a useful tool for measuring sub-bandage pressures."[4]

A new device that has recently been developed for the detection of sleep apnea Watch-PAT 100, which measures peripheral arterial tone (PAT), pulse rate, oximetry, and actigraphy[5] may be a better way to measure limb perfusion. Further study is required in this area.

The reason for concern is best stated by Dayan: "The use of a tourniquet to control bleeding is a necessity in both the surgical and pre hospital settings. Tourniquet application, if preformed properly, can be a life saving procedure, particularly in a traumatic setting such as the battlefield. However, improper or prolonged placement of a tourniquet because of poor medical training can lead to serious injuries, such as nerve paralysis and limb ischemia."[6] Kragh presented in a case report of a tourniquet being in place for 16 hours and "the limb was salvaged and significant functional recovery was accomplished." He concludes, "…it is important for physicians to understand tourniquet injury and appreciate that even prolonged tourniquet application time does not necessarily doom the affected limb."[7] Lakstein studied 91 patients who had tourniquets applied by Israeli Defense Force soldiers and there were very few complications. He concluded that tourniquet application is effective and an easily applied method of prevention of exsanguinations in the military prehospital setting.[8] In the sixth edition of Prehospital Trauma Life Support, the use of tourniquets is confirmed as effective and safe even when their use is prompted by tactical rather than clinical indications. Few and minimal complications resulted from their use.[9] Naimer, in a series of articles,[10–12] has stated that elastic adhesive compression dressings are an effective, reliable technique with a high rate of controlling hemorrhage without complications. The authors have used these dressing on the field, in the ambulance, in the helicopter as well as in the hospital settings. They suggest this technique (elastic adhesive compression dressings) be considered by emergency personnel working in the prehospital arena in selected cases.

CONCLUSIONS

The Emergency Bandage, as proven in this article by direct pressure measurements, functions as a compression bandage over the wound under the pressure bar, and in a tourniquet-like fashion by using the closure bar as a windlass in the same manner as a combat medic would improvise a tourniquet.[9] Reports from the front line confirm our findings of theoretical functionality (Williams D. May, personal communication, 2008).

Further testing is recommended to determine how much restriction of blood flow occurs distal to the area of application of the Performance Systems Emergency Bandage. Testing is also indicated to determine if complete cession of blood flow is possible with enough turns of the closure bar.

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