

Summary of Safety and Effectiveness Data

I. General Information

Device Generic Name: Vascular hemostasis device
Device Trade Name: X-PRESS™ 6 French Vascular Closure System

Applicant's Name and Address: X-SITE Medical, L.L.C.
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Premarket Approval Application Number: P020035

Date of Panel recommendation: Not Applicable

Date of Notice of Approval to Applicant: September 30, 2003

II. Indications for Use

The X-PRESS 6 French Vascular Closure System is indicated for the percutaneous delivery of suture for closing the common femoral artery access site of patients who have undergone diagnostic or interventional cardiac catheterization procedures using sheaths less than or equal to 6 French in size. The X-PRESS 6 French Vascular Closure System is intended to reduce the time to hemostasis, time to ambulation (100 feet), and time to dischargeability in patients who have undergone diagnostic or interventional cardiac catheterization procedures without complicating clinical conditions, including those patients receiving Glycoprotein IIb/IIIa inhibitors.

III. Contraindications

There are no known contraindications for the X-PRESS 6 French Vascular Closure System.

IV. Warnings and Precautions

The Warnings and Precautions can be found in the X-PRESS 6 French Vascular Closure System labeling.

V. Device Description

The X-PRESS™ 6 French Vascular Closure System (X-PRESS) is designed to deliver polyester suture to close femoral artery punctures following diagnostic and interventional catheterization procedures.

The X-PRESS consists of the X-PRESS™ 6 French Vascular Closure Device, a Suture Pack (two needles attached to a braided polyester suture) a Knot Pusher Assembly and a standard .038 – inch guidewire.

The X-PRESS™ 6 French Vascular Closure Device is composed of a molded hub attached to a flexible sheath and an integral needle pusher assembly. The molded hub contains a channel that is designed to guide the two integral needles attached to the braided surgical polyester suture across the arteriotomy.

The suture is a non-absorbable braided polyester marketed under the trade name “Tevdek” and has been cleared for marketing in the United States (N84366/S2) for vascular closure. The suture is the only implantable component of the device.

The X-PRESS™ 6 French Vascular Closure System is a sterile disposable single use device.

VI. Alternative Practices and Procedures

Alternative practices for achieving hemostasis of the femoral artery puncture site post-catheterization include manual compression, mechanical compression, collagen hemostasis devices, and procoagulant injections. Pressure dressings and sandbags are routinely used in combination with compression methods to control oozing.

VII. Marketing History

The X-PRESS has been marketed in Italy. The X-PRESS has not been withdrawn from marketing in any country for reasons related to device safety and effectiveness.

VIII. Potential Adverse Effects of the Device on Health

The X-PRESS was evaluated in a multi-center, randomized prospective controlled clinical study (RACE) involving 493 patients, 393 randomized and 100 non randomized (training).

No device related deaths were experienced in the clinical study. One patient in the device group experienced a pseudoaneurysm that was resolved with thrombin injection. Three patients in the control group experienced a pseudoaneurysm and all three were resolved with thrombin injection. Potential complications of infection, retroperitoneal bleeding, wound dehiscence, nerve injury, vessel laceration or vessel occlusion were not seen.

Table 1: Major Complications

All randomized patients (N=393 Patients)

Description of Event	X-PRESS (N=261)	Standard Compression (N=132)	All Randomized (N= 393)	Difference [p-value]
Major Complications*	0.4% (1/261)	2.3% (3/132)	1.0% (4/393)	1.9% [0.1122]
Infection at the puncture site	0.0% (0/261)	0.0% (0/132)	0.0% (0/393)	0.0% [1.0]
Transfusion due to blood loss	0.0% (0/261)	0.0% (0/132)	0.0% (0/393)	0.0% 1.0]
Ultrasound guided compression	0.4 % (1/261)	2.3% (3/132)	1.0% (4/393)	1.9% [0.1122]
Vascular repair	0.0% (0/261)	0.0% (0/132)	0.0% (0/393)	0.0% [1.0]
Death related femoral puncture	0.0% (0/261)	0.0% (0/132)	0.0% (0/393)	0.0% [1.0]

** A subject is counted only once for multiple occurrences of complications.*

Above data was adjudicated by CEC.

There was no significant difference between the X-PRESS device group and the Standard Compression group in the incidence rate of major complications, which were reported in only 1 (0.4%) and 3 (2.3%) patients in the X-PRESS and standard compression arms of the study respectively, as summarized in Table 1.

Sub Group Analysis

The diagnostic sub group demonstrated no significant difference in the incidence of major complications between the X-PRESS and standard compression group. (Table 2).

Table 2: Major Complications - Diagnostic Patients

	X-PRESS	Standard Compression	Difference
Description of Event	(N=89)	(N=44)	Difference [p-value]
Major Complications*	1.1% (1/89)	0.0% (0/44)	-1.1% [1.0]
Infection at the puncture site	0.0% (0/89)	0.0% (0/44)	0.0% [1.0]
Transfusion due to blood loss	0.0% (0/89)	0.0% (0/44)	0.0% [1.0]
Ultrasound guided compression	1.1% (1/89)	0.0% (0/44)	-1.1% [1.0]
Vascular repair	0.0% (0/89)	0.0% (0/44)	0.0% [1.0]
Death related femoral puncture	0.0% (0/89)	0.0% (0/44)	0.0% [1.0]

** A subject is counted only once for multiple occurrences of complications.*

Above data was adjudicated by CEC.

In the interventional sub group there was a reduced incidence of major complications vs. in the X-PRESS group (0%,0/172) when compared to standard compression(3.4%, 3/88) as summarized in Table 3.

Table 3: Major Complications - Interventional Patients

	X-PRESS	Standard Compression	Difference
Description of Event	(N=172)	(N=88)	Difference [p-value]
Major Complications*	0.0% (0/172)	3.4% (3/88)	3.4% [0.0379]
Infection at the puncture site	0.0% (0/172)	0.0% (0/88)	0.0% [1.0]
Transfusion due to blood loss	0.0% (0/172)	0.0% (0/88)	0.0% [1.0]
Ultrasound guided compression	0.0% (0/172)	3.4% (3/88)	3.4% [0.0379]
Vascular repair	0.0% (0/172)	0.0% (0/88)	0.0% [1.0]
Death related femoral puncture	0.0% (0/172)	0.0% (0/88)	0.0% [1.0]

** A subject is counted only once for multiple occurrences of complications.
Above data was adjudicated by CEC.*

The Non Major complications are summarized in Table 4. There was no significant difference between groups in the percentage of patients experiencing complications in the X-PRESS device vs. the standard compression group (1.9% vs. 2.3% respectively). The complication occurring with the greatest percentage of patients in either treatment group was pseudoaneurysm which was experienced by 0.4% (1/261) and 2.3% (3/132) of patients in the X-PRESS device and standard compression groups respectively. Hematoma > 6 cm was reported in 4 patients (1.5%) in the X-PRESS device group.

Table 4: Non Major Complications

Description of Event	X-PRESS (n=261)	Standard Compression (n=132)	Difference [p – values]
Non Major Complications*	1.9% (5/261)	2.3% (3/132)	0.4% [1.0]
Retroperitoneal bleed	0.0% (0/261)	0.0% (0/132)	0.0% [1.0]
Wound dehiscence	0.0% (0/261)	0.0% (0/132)	0.0% [1.0]
Post discharge arterial bleed	0.0% (0/261)	0.0% (0/132)	0.0% [1.0]
Hematoma>6 cm.	1.5% (4/261)	0.0% (0/132)	-1.5% [0.3053]
Vessel laceration	0.0% (0/261)	0.0% (0/132)	0.0% [1.0]
Nerve injury	0.0% (0/261)	0.0% (0/132)	0.0% [1.0]
AV fistula	0.4% (1/261)	0.0% (0/132)	-0.4% [1.0]
Pseudoaneurysm	0.4% (1/261)	2.3% (3/132)	1.9% [0.1122]
Deep vein thrombosis	0.4% (1/261)	0.0% (0/132)	-0.4% [1.0]
Emboli	0.4% (1/261)	0.0% (0/132)	-0.4% [1.0]

* A subject is counted only once for multiple occurrences of complications.

Above data was adjudicated by CEC.

IX. Summary of non-clinical Studies

In Vitro Laboratory (Bench) Studies

Device Functionality Testing

In-vitro testing was conducted to verify the design of the X-PRESS and its accessories. Results from the mechanical tests demonstrated that the functional performance and reliability of the X-PRESS and accessories were acceptable and consistent with the intended use of the System. See Table 5 below for the results.

Table 5: In-vitro test data

Test	Acceptance Criteria	Results	Test Article
Visual inspection, Physical and dimensional measurements N=30	Meet drawings, quality control specifications	PASSED	Device, Sutured Needle, Needle Pusher, and Knot Pusher.
Shear & Tensile Testing – Suture/Needle N=15 devices each	0.75 lbf min. & 1.5 lbf avg.	PASSED	Sutured Needle
Suture Tensile Testing N=30	3.9 lbf avg.	PASSED	Suture
Needle Bend Test N=15 devices	135° min.	PASSED	Needle
Soft Tip Pull Force N=30	3.37 lbf (15N) and/or 150% elongation	PASSED	Device
Lumen tubing & hub pull force N=30	3.37 lbf (15N)	PASSED	Device
Hub/Shaft pull force N=30	3.37 lbf (15N)	PASSED	Device, Needle Pusher
Tissue Capture N=30	Must capture both sides of the artery wall	PASSED	Simulated Use
Knot Slippage N=30	Knot must not slip from tubing wall	PASSED	Simulated Use

Biocompatibility Testing

Biocompatibility testing of the X-PRESS System has been conducted according to the appropriate contact duration category as set forth in the FDA Modified ISO 10993 Matrix and met GLP guidelines. All tests were performed on complete device assemblies that have been assembled according to the manufacturing procedures. Biocompatibility results meet all standards established in the *Tripartite Biocompatibility Guidance for Medical Devices* or the International Standard ISO-10993, “*Biological Evaluation of Medical Devices Part 1: Evaluation and Testing.*” All device materials have been demonstrated to be nonmutagenic, nontoxic, nonhemolytic, hemocompatible, nonpyrogenic, nonthrombogenic, nonirritating, nonsensitizing, and biocompatible for the intended use.

Table 6: Biocompatibility Testing

Cytotoxicity	L929 MEM Elution Test ISO 10993-5
Irritation Kligman Maximization Test (Modified)	Guinea Pig Maximization Test ISO 10993-10
Intracutaneous Reactivity	Intracutaneous Injection Test ISO 10993-10
Systemic Toxicity	Systemic Injection Test ISO 10993-11
Systemic Toxicity	14 Day Repeat Dose Intravenous Toxicity Study (Subchronic) ISO 10993-11
Pyrogenicity	Rabbit Pyrogen Test (Material Mediated) ISO 10993-11
Mutagenesis	<i>Salmonella Typhimurium</i> and <i>Escherichia Coli</i> Reverse Mutation Assay ISO 10993-3
Hemocompatibility	<u>Hemolysis</u> Complement Activation Assay ISO 10993-4
Hemocompatibility	<u>Hemolysis</u> In-Vitro Hemocompatibility Assay - ISO 10993-4
Hemocompatibility	<u>Hemolysis</u> Rabbit Blood ISO 10993-4
Implantation (Suture Only)	Short-term Intramuscular Implantation Test (30-day) ISO 10993-6
Implantation (Suture Only)	Long-term Intramuscular Implantation Test (90-day) ISO 10993-6

Information supporting the biocompatibility and performance of the Tevdek® polyester braided sutures as documented in PMA N84-366/S2 and 510(K) K930738 is incorporated by reference.

Shelf Life Testing

The X-PRESS Device System was evaluated following exposure to two sterilization cycles and a simulated one year accelerated aging cycle. Testing included a visual inspection, dimensional measurements, and physical performance testing. Results indicate that the devices met or exceeded the acceptance criteria and will be marked with a one year shelf life.

Validation of Sterilization Process

The X-PRESS™ 6 French Vascular Closure System is sterilized using a 100% Ethylene Oxide (EO) Overkill Cycle. The product is sterilized to a sterility assurance level (SAL) of 1×10^{-6} . Validation of the sterilization process was performed in accordance with AAMI/ANSI/ISO 11135:1994 Medical devices - Validation and routine control of ethylene oxide sterilization and CEN 550:1994 Sterilization of medical devices - Validation and routine control of ethylene oxide sterilization.

Animal Studies

Preclinical animal studies were conducted to assess both acute and chronic safety following arterial closure with the X-PRESS device. A total of six swine were treated with the X-PRESS™ Vascular Closure System. Standard surgical technique was used to expose the abdominal aorta. Twenty-five punctures were created using 18 gauge arterial needles. All punctures were then closed with the X-PRESS™ Vascular Closure System. Clinical examination of the sites and the peripheral circulatory system was performed immediately post-procedure and immediately prior to vessel excision. Vessels were excised at approximately 24 hours and 21 days post-procedure such that a detailed pathological assessment could be performed. The pathological examination was intended to identify any unanticipated adverse effects such as vessel trauma, thrombosis, embolization, infection, stenosis, or hematoma formation.

Upon harvest of the treated vessels from all experimental animals, there was no macroscopic evidence of intraluminal thrombus, stenosis, or other intravascular pathology. All pathological exams were consistent with a surgically induced vessel puncture and suture repair. Tissue reaction was consistent with that typically observed following placement of braided polyester suture. No signs of adverse reactions were evident.

X. Clinical Studies

Pilot Study

A pilot study of 16 non randomized patients was completed in September 2000. The primary objective of the Pilot Study was to evaluate the safety and preliminary evidence of effectiveness of the X-PRESS device following percutaneous catheterization of the femoral artery. Additionally, a post procedure (prior to discharge) Doppler flow study of the treatment site was required for all patients and evaluated by the core laboratory.

Following the entry of all 16 patients in the Pilot Phase, the DSMB met in October 2000 to review the safety study and effectiveness data. The DSMB issued a written unanimous decision that the Pilot Phase results met the predefined criteria for progression to the Pivotal Study.

Pivotal Study

The X-PRESS™ 6 F Vascular Hemostasis System was evaluated in a randomized controlled multi-center clinical investigation involving 393 randomized patients at 10 U.S. institutions from April of 2001 to April of 2002. The X-PRESS™ device was compared to Standard Compression (manual or mechanical) methods following interventional and diagnostic percutaneous femoral artery catheterization procedures with 6 F and smaller sheath sizes. Prior to enrollment of randomized patients, one hundred (100) patients were enrolled as non-randomized X-PRESS training patients.

A 2:1 device-to-control randomization ratio was used. Of the 393 randomized patients, 261 (66.4%, 261/393) were randomized to X-PRESS treatment and 132 (33.6%, 132/393) were randomized to Standard Compression. There was also a planned 2:1 ratio of interventional to diagnostic patients. Of the patients randomized to X-PRESS device, 172 (66%, 172/261) received interventional treatments and 89 (34% 89/261) received diagnostic treatments. Of the patients randomized to standard compression, 88 (66.6%, 88/132) were interventional and 44 (33.3%, 44/132) were diagnostic.

The randomized patients were distributed among the institutions as summarized in Table 7.

Table 7: Number of Patients Treated by Site

ITT Population

Site #	X-PRESS	Standard Compression	Total
001	20	10	30
002	16	7	23
004	46	23	69
005	47	22	69
006	25	15	40
007	40	20	60
008	6	4	10
009	21	10	31
011	20	9	29
012	20	12	32

Inclusion and Exclusion Criteria

Patient Selection—Criteria for Inclusion

Candidates for this study met **all** of the following criteria:

- Candidate for diagnostic or interventional cardiac catheterization via a femoral sheath $\leq 6F$.
- Age ≥ 18 years.
- Understand and sign the study specific written informed consent form.
- In the investigator's opinion, the patient is suitable for the X-PRESS device, conventional hemostasis techniques and participation in an investigational trial.
- Eligible for sheath removal in the catheterization lab.

Patient selection—Criteria for Exclusion

Candidates were excluded from the study if **any** of the following conditions applied:

- Known to be pregnant or lactating.
- Immunocompromised.
- Requiring a re-puncture at a site previously punctured within 48 hours.
- Significant anemia (hemoglobin < 10 g/DL, Hct < 30)
- Morbid obesity (BMI > 3.2).
- Participating in another IDE or IND trial that has not concluded the follow-up period or who have previously been enrolled in the RACE Trial.
- An antegrade puncture.

- Baseline INR > 1.5 (e.g. coumadin therapy).
- Known bleeding disorder including thrombocytopenia (platelet count < 100,000 cells/UL), thrombasthenia, hemophilia, or von Willebrand's disease.
- Puncture tract angles >55 degrees.
- small femoral arteries (<4 mm), femoral artery stenosis resulting in a vessel diameter <4 mm, or patients with severe peripheral vascular disease (as defined in Section 18).
- Puncture sites believed to be in the profunda femoris, superficial femoral artery, or at the bifurcation of the arteries.
- Common femoral artery with fluoroscopically visible calcium.
- Femoral arteries that are suspected to have experienced a back wall puncture or that underwent > one (1) arterial puncture during the catheterization procedure.
- Complication(s) at the femoral artery access site pre-sheath removal including hematoma, pseudoaneurysm, or arterio-venous fistula.
- Continued heparin or other anticoagulant/antiplatelet therapy is planned (with the exception of Glycoprotein IIb/IIIa receptor blockers) following completion of the catheterization procedure.
- ACT is >400 seconds immediately prior to removal of the guiding catheter.
- Can not adhere to or complete the investigational protocol for any reason including but not limited to geographical residence or life threatening disease.

Methodology

Patient Screening and Enrollment

Patients scheduled for a coronary catheterization procedure were screened for study eligibility. After being screened for eligibility, the patient was approached prior to the catheterization procedure to obtain written informed consent. The background of the proposed study and the potential benefits and risks of the procedures and study were explained to the patient. Once the patient signed the informed consent, all inclusion criteria were met, and no exclusion criteria were present, the patient was enrolled in the trial. All enrolled patients signed the approved Informed Consent Form. Failure to obtain written informed consent excluded the patient from the study.

Study Population

There was no significant difference between the two randomized groups with regard to age, % males, height, weight, diabetes mellitus, thrombolytic therapy or prior procedures at the same site. (Table 8)

Table 8: Study Population

	Age(yrs)	% males	Height (cm)	Weight (Kg)	Diabetic	Thrombolytic therapy	Prior procedure@ same site
X-PRESS	63.2	76.2	173	80.4	14.2%	2.3%	48.3%
Standard Compression	63.3	76.5	172.6	79.8	18.2%	2.3%	46.2%

Procedure characteristics were comparable between groups, with entry site in the majority of patients via the right femoral artery (88.9%) using a 6F sheath (93.9%). Diagnostic catheterization was performed on 34.8% of patients. In interventional patients 58.5% had PTCA with stent deployment of the interventional patients **51% (134/260) were treated with GP IIb/IIIa inhibitors.**

There were no significant differences between the two randomized groups in procedural characteristics except for ACT levels at the time of sheath pull as described below.

The overall ACT (Activated Clotting Time) level at the time of sheath removal for the X-PRESS group ranged between 89 to 410 seconds with an average of 226 (S.D. 75) seconds. The overall ACT level at the time of sheath removal for the Standard Compression group ranged from 89-249 seconds with an average of 170 (S.D. 51) seconds.

The ACT level for diagnostic X-PRESS patients ranged between 89 to 292 seconds with an average of 145 (S.D. 35) while the ACT level for diagnostic Standard Compression patients ranged between 105 to 217 seconds with an average of 141(S.D. 27) seconds. The X-PRESS interventional patients' ACT ranged between 131-410 seconds with an average of 266 (S.D. 53) seconds while the interventional Standard Compression patients' ACT ranged between 89-360 seconds with an average of 187 (S.D. 54) seconds.

Safety Data

As reported in Table 1, there was no difference in the incidence rate of major complications between the X-PRESS and Standard Compression groups. Major complications were experienced by 0.4 % (1/261) of the patients enrolled in the X-PRESS arm and 2.3% (3/123) enrolled in the standard compression group.

In evaluation of minor complications (Table 4), patients treated in the X-PRESS group experienced an overall complication rate of 1.9%(5/261), with reported complication of hematoma>6 cm ,1.5%(4/261),AV fistula, 0.4%(1/261),pseudoaneurysm, 0.4%(1/261),deep vein thrombosis, 0.4%(1/261) and emboli 0.4%(1/261), with). The Standard Compression group experienced pseudoaneurysm 2.3%(3/132) for an overall complication rate of 2.3%.

Primary Effectiveness Endpoint Data

The pre-specified Primary effectiveness endpoint was time to ambulation which was defined as the time from the removal of the guiding catheter to when the patient stands and can walk 100 feet and maintain hemostasis of the groin site. As summarized in Table 8, mean time to ambulation for X-PRESS patients was less than half that for patients treated with standard compression(5.7±7.19 hrs. vs. 13.9±9.79 hrs. p=0.0001). The primary effectiveness endpoint was met in the entire randomized study population (Table 9) and in the interventional and diagnostic sub groups. (Table 10)

Table 9 Effectiveness Results

ITT populations (N=393 Patients)

Description of Event	X-PRESS	Standard Compression	All Randomized	P-value
Time to ambulation (hrs)*				0.0001
Mean±SD(N) [°]	5.7±7.19(248)	13.9±9.79(128)	8.5±9.02(376)	
Range(Min, Max)	(1.5-74.9)	(3.1-70.2)	(1.5-74.9)	
Median	<3.4>	<11.2>	<4.9>	

* The comparison of the survival curves of two treatments are evaluated by the Log-rank test.

[°] The number of patients is less than the number studied due to missing patient data

Summary of Secondary Effectiveness Endpoint Clinical Data

Patients enrolled in the X-PRESS Arm of the study met all secondary effectiveness endpoints. Patients treated in the X-PRESS group demonstrated an improved time to hemostasis (p=0.0001). Patients were ready for discharge in almost half the time required for standard compression patients (7.7±9.63 vs. 15.2±10.84 hr, respectively, p=0.0001). The actual time of discharge also was significantly reduced in the X-PRESS group when compared to standard compression (28.2±35.55 vs. 37.0±51.80 hr, respectively, p=0.0206).

There was no significant difference between patients randomized to either the X-PRESS or standard compression groups in treatment success (92 % vs. 97%, respectively, p=0.1122).

Table 10: Effectiveness Table by procedure type

	Diagnostic			Interventional		
	X-PRESS	Standard Compression	p-value	X-PRESS	Standard Compression	p-value
	Mean (SD) n° Median Range	Mean (SD) n° Median Range		Mean (SD) n° Median Range	Mean (SD) n° Median Range	
Time to Ambulation (hours) *	3.0 (4.87) 84 2.2 1.5-45.7	8.5 (11.32) 42 6.2 3.1-70.2	0.0001	7.1 (7.78) 164 4.1 2.0-74.9	16.5 (7.8) 86 14.7 5.4-45.5	0.0001
Time to Hemostasis (min) *	11.7 (15.76) 88 9.0 1.0-140.0	54.7 (31.41) 44 49.5 11.0-180.0	0.0001	29.8 (82.86) 170 10.0 2.0-666.0	280.2 (172.63) 86 269.5 36.0-1170	0.0001
Time to Dischargeability (hours) *	3.7 (5.24) 85 2.5 1.5-45.8	9.3 (13.56) 42 6.4 3.6-70.2	0.0001	9.7 (10.69) 167 5.3 2.7-74.9	18.1 (7.82) 86 16.8 7.0-45.5	0.0001
Time to Discharge (hours) *	23.6 (50.46) 85 4.8 2.1-319.7	36.4 (59.46) 44 7.6 3.4-217.4	0.0164	30.5 (24.61) 167 24.2 4.9-193.3	37.3 (47.74) 85 25.3 17.1-352.8	0.06
Treatment success (%) n#	94.4% (84/89)	100% (44/44)	0.1701	90.7 (156/172)	95.5% (84/88)	0.2233
Procedure success (%) n#	98.9% (88/89)	100% (44/44)	1.00	100% (172/172)	96.6% (85/88)	0.0379

* The comparison of the survival curves of two treatments are evaluated by the Log-rank test.

Categorical variables are evaluated by Fisher's exact test

° The number of patients is less than the number studied due to missing patient data.

Time to ambulation is defined as the time from the removal of the guiding catheter to when the patient stands and can walk 100 feet and maintain hemostasis.

Time to hemostasis is defined as the time from sheath removal to cessation of common femoral artery bleeding as determined by visual inspection.

Time to dischargeability measured from the time from the removal of the last catheter to when the patient is ready for discharge, defined as the ability to walk 100 feet, freedom from orthostatic hypotension (stable blood pressure and heart rate after ambulating), ability to void and a stable groin site without bleeding or expansion of prior hematoma.

Treatment Success is defined as the attainment of stable hemostasis of the femoral arteriotomy site utilizing the randomized treatment only and freedom from a major complication through the follow-up period of approximately 14 days following treatment.

Procedure Success is defined as achievement of hemostasis without occurrence of major complication through the follow up period of approximately 14 days following treatment.

Device Malfunction

Device malfunction was defined as any failure of the device to perform as specified in the instructions for use. In the randomized patients there were eight reported device malfunctions as summarized in Table 10.

Table 10 Device Malfunctions

Type of malfunction	Number of Patients
Bent needle pusher	5
Suture break	2
Knot locked	1

Of the 8 device malfunctions, one device with a bent needle pusher was able to be exchanged for a new device and the patient experienced a successful closure with a second X-PRESS device. Six patients successfully crossed over to standard compression with no complication. One patient crossed over to standard compression and later reported a minor complication (hematoma >6cm, DVT and emboli). Device malfunctions were not associated with any excess risk of major complication compared to all other X-PRESS treated patients.

Conclusions Drawn from Studies

Results of the *in vitro*, animal studies and clinical investigations provide valid scientific evidence and reasonable assurance the X-PRESS 6 French Vascular Closure System is safe and effective when used in accordance with its labeling. The safety of the device has been demonstrated by the fact that the incidence of major and minor complications was equivalent or lower in the X-PRESS treatment arm as compared to the Standard Compression arm.

The effectiveness of the X-PRESS 6 French Vascular Closure System was demonstrated by a significant reduction in time to ambulation, time to hemostasis and time to dischargeability in both diagnostic and interventional patients and a significant reduction in time to discharge in diagnostic patients treated with the X-PRESS device when compared to those treated with standard compression.

XI. Panel Recommendations

In accordance with the provisions of section 515(c)(2) of the act as amended by the Safe Medical Devices Act of 1990, this PMA was not referred to the Circulatory System Devices Panel, an FDA advisory committee, for review and recommendation because the information in this PMA substantially duplicates information previously reviewed by the panel.

XII. FDA Decision

FDA issued a PMA approval letter to X-SITE Medical on September 30, 2003.

XIII. Approval Specification

Instructions for Use: See the labeling

Hazards to Health from the use of the Device: See Indications, Contraindications, Warnings, Precautions, and Adverse Events section of the labeling.

Post-approval Requirements and Restrictions: See approval order.