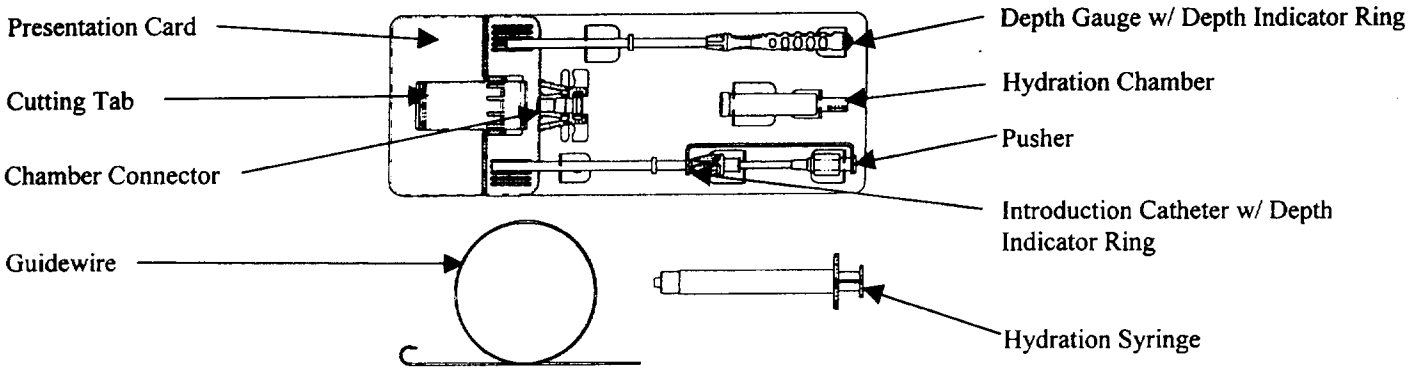
QUICKSEAL ™
FEMORAL ARTERIAL CLOSURE SYSTEM
INSTRUCTIONS FOR USE

DESCRIPTION:
The QuickSeal Femoral Arterial Closure System contains (1) Hydration Chamber & Chamber Connector, (1) Introduction Catheter with Depth Indicator Ring, (1) Pusher, (1) Depth Gauge with Depth Indicator Ring (1) .025" Guidewire, (1) 3cc Hydration Syringe, Foam Cutting Tab and Size 100 Compressed Gelfoam® Absorbable Gelatin Sponge. Note: this product contains no bovine or bovine derived substances.



CAUTION: Federal (USA) Law restricts this device to sale by or on the order of a physician.

INDICATIONS:
The QuickSeal Femoral Arterial Closure System is intended for the delivery of Gelfoam for "extravascular" closure of femoral artery access sites. The system is indicated for use in reducing time to hemostasis, at femoral artery puncture sites and in reducing time to ambulation in patients who have undergone diagnostic or interventional procedures using 8 French or smaller procedural sheaths. The device reduces time to eligibility for hospital discharge in patients who have undergone diagnostic or interventional procedures and reduces time to actual hospital discharge in patients who have undergone diagnostic procedures.

CONTRAINDICATIONS:
This product is not intended for intravascular use.
The QuickSeal should not be used in patients who have a sensitivity or allergy to porcine derived material.
The QuickSeal should not be used if posterior arterial wall puncture is suspected, as this may lead to bleeding complications.

WARNINGS:
Do not use the QuickSeal device in contaminated sites as it may potentiate infection.
The Quick Seal system was not tested in patients with uncontrollable hypertension (blood pressure not controllable to < 170/100 mmHg) and its use in these patients may not be effective.
The QuickSeal system was not tested in patients with blood clotting disorders and its use may not be successful in that clinical situation.

PRECAUTIONS:
- This product is intended for use only by clinicians and medical personnel with adequate training in the use of the device.
- Two people should perform the QuickSeal procedure.
- Discontinue advancement of the QuickSeal components if there is excessive resistance and manually compress until hemostasis is achieved.
- If uncharacteristic resistance is met during advancement of the QuickSeal components to the access site, determine cause of resistance prior to advancing device.
- In the event that hemostasis is not achieved following use of the QuickSeal device, use manual compression until hemostasis is achieved.
- Only use the QuickSeal Introduction Catheter to deliver the Gelfoam.
- Location of puncture site must allow sufficient unimpeded access to apply proximal digital pressure.
- Only one pledget of Gelfoam should be delivered to site.

The safety and effectiveness of using the QuickSeal device has not been established in the following patient populations:
- Patients with pre-existing autoimmune disease.
- Patients undergoing intra-procedural therapeutic thrombolysis.

- Patients with punctures through a vascular graft.
- Patients who are morbidly obese and/or where usable length of device (7.5cm) is exceeded or patients where the arterial access site depth is < 3 cm.
- Patients with double wall punctures.
- Patients with palpable hematomas present prior to sheath removal.
- Patients with a bleeding disorder, including thrombocytopenia (<100,000 platelet count), thrombasthenia, von WilleBrand's disease, or anemia (Hgb < 10mg/dl, Hct < 30).
- Patients who have had an arterial site closed with the QuickSeal device within the previous 6 weeks.
- Patients who are pregnant or lactating.
- Patients who are younger than 18 or older than 80 years of age.
- Patients requiring multiple punctures for vascular access.
- Patients with ipsilateral venous sheaths.

ADVERSE EVENTS

POTENTIAL COMPLICATIONS:

The risks associated with the use of the QuickSeal Arterial Closure System are considered low and include bleeding or hematoma due to improper delivery of the Gelfoam, embolism or thrombosis due to intravascular delivery of Gelfoam, damage to artery and infection.

The QuickSeal Arterial Closure System was evaluated in a multi-center, randomized, prospective, controlled clinical investigation involving 398 patients.

One death was reported during the randomized investigation, which was determined not to be device-related. The patient was randomized to the QuickSeal device. The cause of death was identified as an acute Myocardial Infarction and Coronary Artery Disease. No device related deaths were experienced in the study. One patient in both the device and control arms of the randomized patients, required a transfusion and two patients in the device arm experienced a pseudoaneurysm that was resolved by thrombin injection.

Potential complications of allergic reaction, adhesion formation, infection or abscess, foreign body reaction, wound dehiscence or vessel occlusion were not seen.

Table 1: Incidence of all Complications
Percentage/Number of Patients with an Event

Description of Event	QuickSeal N= 240	Manual Compression N= 158	Difference [95% C.I.] (a)
Major Complications	3 (1.3%)	1 (0.6%)	(-100, 2.2)
Vascular Repair			
Vascular damage requiring repair	2 (0.8%) (d)	0 (0.0%)	(-100, 1.8)
Bleeding or hematoma requiring repair	1 (0.4%) (e)	1 (0.6%) (f)	(-100, 1.0)
Total: Any Vascular Repair	3 (1.3%)	1 (0.6%)	(-100, 2.2)
Minor Complications			
Hematoma (2cm – 6cm)	33 (13.8%)	13 (8.2%)	(-100, 10.7)
Hematoma > 6cm	4 (1.7%)	0 (0.0%)	(-100, 3.0)
Ecchymosis	17 (7.1%)	12 (7.6%)	(-100, 3.9)
Bleeding	5 (2.1%)	3 (1.9%)	(-100, 2.5)
Minor pseudoaneurysm requiring no intervention	1 (0.4%)	0 (0.0%)	(-100, 1.1)
Total Minor Complications:	50 (20.8%)	24 (15.2%)	(-100, 12.0)
Device Failure (b)	8 (3.3%)	N/A	
Procedure Failure (c)	5 (2.1%)	1 (0.6%)	
Non-closure Method Related Complications	33 (13.8%)	18 (11%)	

(a) 95% C.I. represents a one sided confidence interval of the true difference between the percentage of patients with complications (QuickSeal- Control)
(b) Device failure rate was defined as the number of patients in which hemostasis was not achieved using the QuickSeal device or a major complication occurred.
(c) Procedure failure rate was defined as the number of patients in which hemostasis was not achieved, or a major complication occurred.
(d) Both patients experienced a pseudoaneurysm requiring a thrombin injection.
(e) Patient experienced a hematoma requiring a transfusion (one unit of packed red blood cells).
(f) Patient experienced a 10 x 10 cm hematoma requiring a transfusion (two units of packed red blood cells).

CLINICAL STUDIES

Randomized Multi-Center Clinical Investigation

The QuickSeal Arterial Closure System was evaluated in a multi-center, randomized, prospective, controlled clinical investigation involving 398 patients. The QuickSeal Device was compared to Manual Compression methods following interventional and diagnostic catheterization procedures with 8 Fr and smaller sheath sizes. Of the 398 randomized patients, 240 (60%) were randomized to QuickSeal and 158 (40%) were randomized to Manual Compression. Of the patients randomized to QuickSeal, 145 (60%) were post-intervention and 95 (40%) were post-diagnostic angiography. In the patients randomized to Manual Compression, 100 (63%) were post-intervention and 58 (37%) were post-diagnostic angiography.

Patients were enrolled if they met the following criteria:

- Age18 years to 80 years
- Either sex, male or female
- Candidates for diagnostic or therapeutic procedures performed percutaneously via the common femoral artery
- Written informed consent
- Agreement to return for a follow-up evaluation and, in a subgroup, patient agreed to an ultrasound examination of the femoral artery
- Anticipated use of 8 French or smaller procedural sheath

Patients were excluded from the investigation if they met any one of the following criteria:

- Pre-existing autoimmune disease
- Obesity where the usable length of the device (7.5 cm) is exceeded
- Ipsilateral arterial site closure with the QuickSeal device within previous 6 weeks, or closure utilizing another closure device within 180 days
- Pregnant or lactating
- Significant bleeding or platelet disorders including Thrombocytopenia (with <100,000 platelet count), Von Willebrand's disease, anemia (Hgb <10 mg/dl, Hct <30) and Thrombasthenia
- Uncontrolled hypertension (blood pressure not controllable to <170/100 mm Hg)

The Intra-Procedural exclusion criteria included the following: bleeding pre- or post- sheath removal; an arterial introducer sheath size of >8F; suspected bacterial contamination of access site; punctures through a vascular graft; double wall punctures; ipsilateral venous sheaths; palpable hematomas present prior to sheath removal; uncontrollable hypertension (blood pressure not controllable to <170/100 mm Hg) from time of sheath removal to time of ambulation; multiple punctures required for vascular access; patient is not alert and/or cooperative; intra-procedural therapeutic thrombolysis; arterial closure depth is <3 cm or >7.5 cm; patients whose ACT levels >300 seconds when the sheath is pulled for patients not receiving GP IIb/IIIa platelet inhibitors, or >250 seconds for patients receiving GP IIb/IIIa platelet inhibitors. Since the QuickSeal Arterial Closure System is completely extravascular, patients with arterial vascular disease in the femoral artery were not excluded from the study.

There was no significant difference between the two randomized groups (QuickSeal and Manual Compression) with respect to age, gender, and height. The average age for randomized patients was 62 and 61 years for the QuickSeal and Control patients respectively. A higher number of male patients were enrolled in the study (65%) male vs. (35%) female, which is a reflection of the general referral pattern for patients undergoing interventional and diagnostic procedures. There was a difference in weight between the QuickSeal device and Manual Compression treated patients. Patient's weight in the QuickSeal group was an average of 194 lbs. (88.4 kg) and the Manual Compression group was an average of 183 lbs (83 kg). The variance in weight is considered to be by chance, and is due to the randomized process that dictates whether the patient will receive treatment with the QuickSeal or Manual Compression. Adjustment for this imbalance in a multivariate analysis does not impact the treatment effect.

There was no significant difference in risk factors, blood, or other pre-procedural characteristics between the QuickSeal and Manual Compression patients. Twenty-five percent (25%) of the QuickSeal patients and 24% of the control patients were diagnosed with PVD (peripheral vascular disease) and 32% of both the QuickSeal and Manual Compression patients were identified as having diabetes. Twenty-six percent (26%) of the QuickSeal and 23% of the Manual Compression patients exhibited claudication and/or a non-palpable distal pulse.

There was no significant difference between the two randomized groups with respect to Intra-Procedural Characteristics, with the exception of ACT levels at sheath pull and the total sheath indwelling time.

A total of 96 (24%) of the patients studied received GP IIb/IIIa platelet inhibitors. Fifty-three (22%) of the QuickSeal patients and 42 (27%) of the Manual Compression patients received GP IIb/IIIa platelet inhibitors.

The overall ACT (Activated Clotted Time) level at time of sheath pull for the QuickSeal group ranged from 94 to 300 seconds with an average of 187 (std. Dev. 58) seconds. The overall ACT level at time of sheath pull for the Manual Compression group ranged from 87 to 299 seconds with an average of 156 (std. Dev. 28) seconds. The ACT level for diagnostic QuickSeal patients ranged from 94 to 298 seconds with an average of 141 (std. Dev. 37) seconds, and 87 to 186 seconds with an average of 134 (std. Dev. 25) for the Manual Compression patients. The ACT level for interventional therapeutic patients ranged from 104 to 300 seconds with an average of 217 (std. Dev. 49) seconds for QuickSeal, and 114 to 299 seconds with an average of 161 (std. Dev. 25) for the Manual Compression group.

Twenty-six percent (26%) of the QuickSeal and 23% of the Manual Compression patients included 5 French sheaths. Thirty-nine percent (39%) of the QuickSeal and 41% of the Manual Compression patients included 6 French sheaths. Thirteen percent (13%) of the QuickSeal and 15% of the Manual Compression patients included 7 French sheaths. Twenty-three percent (23%) of the QuickSeal and 20% of the Manual Compression patients involved 8 French sheaths.

Patients were followed in the hospital and at the follow-up clinical evaluation for evidence of device-related major complications or other vascular complications. Femoral artery ultrasounds were performed at the follow-up visit on 221 randomized patients for evidence of pseudoaneurysms and arterio-venous (AV) fistula. All but 45 of the randomized patients returned for the follow-up visit with 221 receiving an ultrasound. One patient was found dead at his home prior to the 30-day follow-up period. The cause of death was identified as an acute Myocardial Infarction and Coronary Artery Disease. This particular patient was randomized to the QuickSeal device. This death was <u>not</u> device related.

In both the diagnostic and interventional groups, use of the QuickSeal resulted in statistically significant decreases in time to hemostasis, time to ambulation, time to hospital discharge, and the time a patient is deemed eligible for hospital discharge as compared to Manual Compression. There was no significant difference in the rate of major complications overall between the QuickSeal group as compared to the manual compression group (1.3% vs. 0.6%, P=0.220)

Table 2: Overall Effectiveness Table

	QuickSeal n=240		**Manual Compression** n=158		**p-value**
	Mean (SD)	**Median**	**Mean (SD)**	**Median**	
Time to Hemostasis (min)	18.5 (14.4)	15.0	131.6 (159.2)	67.5	<0.001(c)
Time to Ambulation (hours)	5.1 (8.2)	4.2	9.6 (5.1)	5.1	<0.001 (c)
Time to Discharge (hours) Eligible	6.6 (8.3)	4.9	15.4 (58.1)	9.0	<0.001 (c)
Time to Discharge(hours) Actual	26.2 (43.7)	20.6	36.3 (81.3)	22.2	0.006 (c)
Device Success (a)	232/240 (96.7%)		N/A		N/A
Procedure Success (b)	235/240 (97.9%)		157/158 (99.4%)		0.409 (d)

(a) Device failure rate was defined as the number of patients in which hemostasis was not achieved using the QuickSeal device or a major complication occurred.
(b) Procedure failure rate was defined as the number of patients in which hemostasis was not achieved, or a major complication occurred. The number of patients is less than the total number of patients studied due to missing data from some patients.
There were no malfunctioning QuickSeal devices.
(c) P-value is based on Wilcoxon Rank Sum Test
(d) P-Value is based on Fisher's Exact Test

Table 3: Effectiveness Table by procedure type

	Diagnostic			Interventional		
	QuickSeal	Manual Compression	p-value (a)	QuickSeal	Manual Compression	p-value (a)
	Mean (SD) **Median** Range	Mean (SD) **Median** Range		Mean (SD) **Median** Range	Mean (SD) **Median** Range	
Time to Hemostasis (min)	17 (7.8) **15** 5-48	33.9 (17.9) **29** 5-85	<0.001	19.5 (17.4) **15** 5-167	187.8 (176.5) **176.5** 10-936	<0.001
Time to Ambulation (hours)	2.3 (2.2) **1.5** 0.9-16.2	5.87 (1.34) **5.8** 4.1-9.9	<0.001	6.9 (10) **4.4** 1.1-94.1	11.8 (5.2) **10** 4.3-24.6	<0.001
Time to Discharge (hours) Eligible	4.0 (3.9) **3.2** 1.1-27.2	6.6 (1.4) **6.4** 4.6-10.9	<0.001	8.3 (9.9) **6.2** 1.1-94.1	20.4 (72.6) **11.4** 4.5-733.3	<0.001
Time to Discharge (hours) Actual	22.7 (50.6) **4.3** 1.8-298.8	24.1 (42.9) **7.1** 4.6-213.7	<0.001 (a)	28.5 (38.6) **22.7** 3.1-436.1	43.5 (96.4) **23.3** 6.5-890.3	0.096

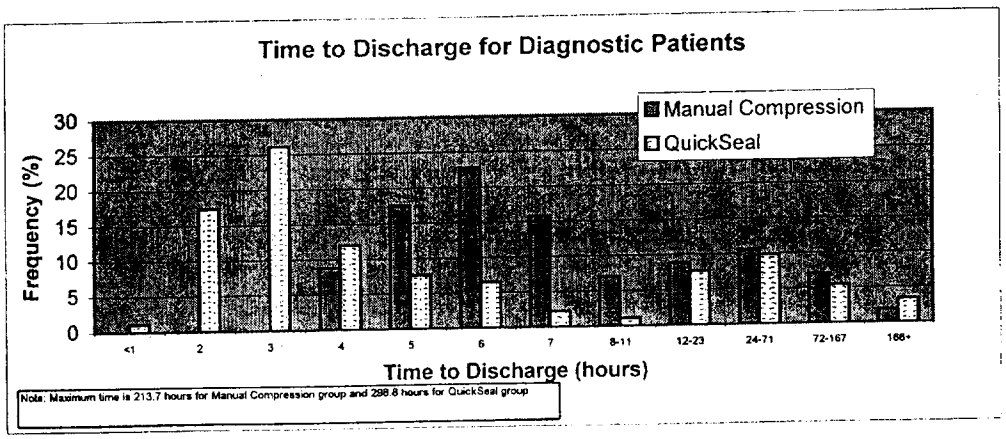
(a) P-Value is based on Wilcoxon Rank Sum Test. The time to discharge results for the diagnostic group are skewed to high values, as evidenced by the large difference between the mean and the median in both treatment groups. While the range for the QuickSeal diagnostic patients is 1.8-298.8 hours, 81.5% (75/92) of patients were discharged within 24 hours and 91.3% (84/92) of patients were discharged within 72 hours. Similarly, in the manual compression group, the range was 4.6-213.7 hours, with 80.7% (46/57) of patients being discharged within 24 hours and 91.2% (52/57) of patients being discharged within 72 hours. The skewed nature of this data necessitates the use of a non-parametric test, such as the Wilcoxon Rank Sum Test used above. This test is highly significant ($p<0.001$), which reflects the large difference in median time to discharge between the two groups (4.3 hours for QuickSeal versus 7.1 hours for manual compression).

Time to hemostasis is defined as the interval (in minutes) between the time the interventional or diagnostic procedure ends and the time at which hemostasis is achieved. Hemostasis is defined as the absence of bleeding and the absence of a palpable hematoma at the access site.

Time to ambulation is defined as the interval (in hours) between the time the interventional or diagnostic procedure ends and the time at which the patient walks 10 feet.

Time to discharge (eligible) the interval (in hours) between the time the interventional or diagnostic procedure ends, and the time the patient is deemed eligible for discharge from the hospital based solely on the hemostasis results.

Time to discharge (actual) the interval (in hours) between the time the interventional or diagnostic procedure ends, and the time the patient was actually discharged from the hospital.



PROCEDURE:

1. Inspect kit contents for damage to product or sterile barrier. Do not use if product is damaged or sterile barrier compromised. Prepare and utilize kit under aseptic conditions.
2. Cut Gelfoam to size by aligning the material against the stop under the Cutting Tab on the Presentation Card and pressing firmly on the Tab (Figure 1).
3. Roll the cut material tightly around the longitudinal axis and insert into open end of Hydration Chamber (Figure 2). Squeezing wings of Chamber Connector, attach Chamber Connector to Hydration Chamber (Figure 3). Press firmly to secure.
4. Attach Hydration Chamber to Introduction Catheter
5. Fill 3cc syringe with sterile ***non-heparinized*** saline and attach to female Luer of Hydration Chamber. With pusher secured, purge system by slowly instilling saline into chamber until saline exits the pusher hub. Cover pusher hub with finger and apply firm pressure to syringe plunger several times to facilitate complete hydration of the Gelfoam (Figure 4).
6. Release the pusher from Introduction Catheter and advance Gelfoam to distal end of the Introduction Catheter by ***slowly*** applying firm, consistent pressure to the syringe (minimum 5 seconds), while applying gentle resistance to pusher. The material is properly staged when it has moved out of the hydration chamber and into the Introduction Catheter (Figure 5).
7. Detach the Hydration Chamber from the Introduction Catheter (Figure 6).
8. Place the Guidewire through the procedural access sheath. Apply manual occlusive pressure proximal to the access site and remove sheath. NOTE: Proximal occlusive pressure must be applied throughout this portion of the procedure and continued until entire system has been removed.
9. Place Depth Gauge over proximal end of Guidewire. Holding Guidewire in fixed position, advance Depth Gauge until elastic response to outer vessel wall is confirmed. NOTE: If excessive bleeding is observed at skin surface, remove Depth Gauge and Guidewire and apply manual compression to achieve hemostasis per accepted institutional practices. Do not attempt to deploy QuickSeal device.
10. Slide Depth Indicator Ring to surface of skin to register depth (Figure 7). Remove Depth Gauge from puncture site. Maintain proximal occlusive pressure.
11. Slide Depth Indicator Ring on Introduction Catheter to a position corresponding to Depth Indicator Ring on Depth Gauge (Figure 8).
12. Grasp hub of Introduction Catheter and insert proximal end of Guidewire through exposed Gelfoam at distal end of Introduction Catheter. Advance Introduction Catheter over Guidewire until proximal end of Guidewire extends beyond Pusher.
13. Holding proximal end of Guidewire fixed and grasping hub of Introduction Catheter, advance Introduction Catheter until Depth Indicator Ring reaches skin surface unless elastic response from vessel contact is encountered before reaching depth marker, in which case, advance the Introduction Catheter no farther (Figure 9).
14. While maintaining position of Pusher relative to patient, *withdraw* Introduction Catheter to indicator line, (approximately 3/4 distance to Pusher hub) and then move Pusher forward toward Introduction Catheter to completely deploy material (Figure 10). Maintain proximal occlusive pressure.
15. Remove Guidewire from Introduction Catheter and remove catheter from access site. Immediately initiate non-occlusive, diffuse pressure over access site.
16. Immediately reduce proximal occlusive pressure allowing partial distal flow, while maintaining non-occlusive/diffuse pressure directly over site for a total of 4-5 minutes. If persistent bleeding or an expanding palpable hematoma is detected after the initial 5 minutes, resume diffuse pressure for a minimum of 5 additional minutes.
17. After patient has had outer dressing applied to site, record information on SUB-Q label provided, and apply over dressing.

HOW SUPPLIED:

Sterile. Do not resterilize. For single use only. Delivery System fluid path components are non-pyrogenic.

STORAGE AND HANDLING:

Handle with care. Packages should be stored at room temperature, 20-25° C (68-77°F), and in a manner that protects the integrity of the package and sterile barrier.

PRODUCT INFORMATION DISCLOSURE:

SUB-Q, Inc. (SUB-Q) has exercised reasonable care in the manufacture of the device. SUB-Q excludes all warranties, whether expressed or implied by operation of law or otherwise, including, but not limited to, any implied warranties of MERCHANTABILITY or FITNESS, since handling, storage, cleaning, and sterilization (Do not resterilize) of these devices by the user as well as factors relating to the patient, the diagnosis, treatment, surgical therapy, and other matters beyond SUB-Q's control directly affect this device and the results obtained from its use. SUB-Q shall not be liable from INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, or EXPENSE, directly or indirectly arising from the use of this device. SUB-Q, neither assumes, nor authorizes any other person to assume for it, any other or additional LIABILITY or RESPONSIBILITY in connection with this device.

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