



REF 10-5005

**Read Instructions for Use Prior to Using this Product.**

Instructions for Use

**DESCRIPTION**

The DuraSeal Dural Sealant System consists of components for preparation of a synthetic absorbable sealant, and an applicator for delivery of the sealant to the target site.

The sealant is composed of two solutions, a polyethylene glycol (PEG) ester solution and a trylisine amine solution (referred to as the 'blue' and 'clear' precursors, respectively). When mixed together, the precursors cross link to form the hydrogel sealant. The mixing of the precursors is accomplished as the materials exit the tip of the applicator.

The hydrogel implant is naturally absorbed in approximately 4 to 8 weeks, sufficient time to allow for healing. The breakdown products are readily cleared from the body, primarily through the kidneys.

The DuraSeal Dural Sealant System is provided sterile and consists of the following packaged in a lidded tray:

- Powder Vial/Diluent Syringe Assembly
- Clear Precursor Syringe
- Applicator
- Spray Tips (3)
- Plunger Cap

**INDICATION**

The DuraSeal Dural Sealant System is intended for use as an adjunct to sutured dural repair during cranial surgery to provide watertight closure.

**CONTRAINDICATIONS**

- Do not apply the DuraSeal hydrogel to confined bony structures where nerves are present since neural compression may result due to hydrogel swelling. The hydrogel may swell up to 50% of its size in any dimension.

**WARNINGS**

- The safety and performance of the DuraSeal hydrogel has not been established:
  - In patients with a known allergy to FD&C Blue #1 dye.
  - In patients undergoing a cranial procedure that entails a dural incision involving penetration (other than superficial) of the air sinus or mastoid air cells.
  - In patients with severely altered renal or hepatic function.
  - In combination with other sealants or hemostatic agents.
  - In patients with a compromised immune system or autoimmune disease.
- Do not use if an active infection is present at the surgical site.

**PRECAUTIONS**

- Use only with the delivery system provided with the polymer kit.
- The DuraSeal Dural Sealant System is provided sterile. Do not use if packaging or seal has been damaged or opened. Do not re-sterilize.
- The DuraSeal Dural Sealant System is intended for single patient use only. Discard opened and unused product.
- Do not use if the PEG powder is not free flowing.
- Use within 1 hour of preparing the blue precursor.
- Prior to application of the DuraSeal hydrogel, ensure that adequate hemostasis has been achieved.
- Incidental application of DuraSeal hydrogel to tissue planes that will be subsequently approximated, such as muscle and skin, should be avoided.
- Use in patients with surgical wound classification Class I/Clean, where the linear extent of the durotomy is at least 2 cm, and where the dural margin from the edges of the bony defect is at least 3 mm throughout.
- The safety and performance of the DuraSeal hydrogel has not been established:
  - In persons younger than 18 years of age.
  - In procedures involving petrous bone drilling.

**ADVERSE EVENTS**

**Potential Adverse Events**

All surgical procedures are associated with a level of risk. A common risk associated with an incision in the brain tissue is CSF leak, which may result in development of meningitis. Other potential complications that may result from a CSF leak in the head include inflammation of the area adjacent to the leak, severe headaches, low pressure inside the brain from loss of fluid, damage to the nerve roots, decreased function of the nervous system, collections of fluid in the brain compartments, and the formation of fluid-filled cysts.

Potential risks and adverse events that could occur from the use of the DuraSeal Dural Sealant System include, but are not limited to, wound infection, immediate, delayed and/or persistent CSF leak, renal compromise, inflammatory reaction, neurological compromise, allergic reaction and/or delayed healing.

**Observed Adverse Events**

The DuraSeal Dural Sealant System was evaluated in 111 investigational patients in the pivotal clinical study. The following table presents any adverse event occurring at a rate of 1% or higher in these patients. Adverse Event rates presented are based on the number of patients having at least one occurrence of a particular adverse event divided by the total number of patients treated.

The incidence and nature of adverse events observed in this patient population are

consistent with the type and complexity of the surgery performed and the co-morbid state of the treated patients. There were no unanticipated adverse device effects. There were two patient deaths (out-of-hospital). In both cases, the deaths were attributed to the patients' prior condition.

AE category	# of patients N (%)
Arrhythmia	6 (5.4)
Bleeding	4 (3.6)
Cerebral Edema	4 (3.6)
CSF Leak (protocol definition)	5 (4.5)
Deep Surgical Site Infection	8 (7.2)
Dermatologic Events	11 (9.1)
Dizziness	8 (7.2)
Edema (non-systemic)	19 (17.1)
Electrolyte Imbalance	11 (9.9)
Elevated Liver Enzymes	11 (9.9)
Fever Post-op (> 38.5°C for 48 h)	6 (5.4)
Fever (< 38.5°C for < 48 h)	5 (4.5)
General Malaise	9 (8.1)
General - Other: Corneal abrasion, chemotherapy complication, hiccoughs	3 (2.7)
GI Disturbance	16 (14.4)
Headache (not responding to standard therapy)	5 (4.5)
Headache (responding to standard therapy)	9 (8.1)
Hematologic Abnormality	7 (6.3)
Hydrocephalus	4 (3.6)
Hypertension	5 (4.5)
Infection (non-incisional) (e.g. thrush, otitis media, keratitis, catheter-related infection)	8 (7.2)
Late (> 30 days) Wound Infection	3 (2.7)
Meningitis (Aseptic)	5 (4.5)
Meningitis (Bacterial)	2 (1.8)
Musculoskeletal Events	21 (18.9)
Nausea and/or Vomiting	24 (21.6)
Neurological Symptoms	
Cognitive	5 (4.5)
Cranial Nerve Deficit	34 (30.0)
Motor Deficit	17 (15.3)
Neuropsychiatric disorders	7 (6.3)
Speech Difficulty	10 (9.0)
Visual Disturbance	22 (19.8)
Pain, Incisional	2 (1.8)
Peripheral edema	2 (1.8)
Pneumonia	3 (2.7)
Pseudomeningocele (responding to conservative therapy)	2 (1.8)
Respiratory Difficulties	6 (5.4)
Seizure	3 (2.7)
Stoke/CVA/Cerebral Hemorrhage	5 (4.5)
Subdural Hematoma	2 (1.8)
Upper Respiratory/Bronchial Infection	4 (3.6)
Ureterolithiasis	2 (1.8)
Urinary Tract Infection	11 (9.9)
Urinary Difficulty	9 (8.1)
Urogenital - Other	2 (1.8)
Wound erythematic/inflammation	2 (1.8)

**CLINICAL EXPERIENCE**

A prospective, multi-center, non-randomized, single arm clinical investigation to evaluate the safety and effectiveness of the DuraSeal Dural Sealant System as an adjunct to sutured dural repair was conducted. The study involved 10 investigational sites within the United States and 1 site in Europe. A total of 111 patients were treated with the DuraSeal Sealant.

The primary endpoint for this study was the percent (%) success in the treatment of intraoperative CSF leakage following DuraSeal Sealant application defined as no CSF leakage from dural repair intra-operatively after up to two DuraSeal Sealant applications during Valsalva maneuver up to 20 cm H<sub>2</sub>O for 5 to 10 seconds.

All 111 patients treated with the DuraSeal Sealant showed no leakage during the intra-operative assessment.

109 of 111 patients (98.2%) met the criteria for primary endpoint success; i.e., intraoperative sealing. Safety was assessed based on evaluation of wound healing, the occurrence of post-operative CSF leaks, the nature and severity of other adverse events, and adverse device-related adverse events diagnosed by physical examination, protocol-specified diagnostic laboratory tests, neurological assessments (including pain and modified Rankin Scale) and CT imaging assessment performed by independent radiologists for evaluation of extradural collections and adverse findings.

The incidence of post-op CSF leaks in this study was low (4.5%). Deep wound infections occurred in 7.2% of patients (with a total of 9 events documented for 8 patients).

All wounds were well healed by the 3-month post-operative visit. There was no untoward effect on hepatic or renal function associated with product use and absorption. Additionally, there were no unexpected findings based on CT imaging assessment by independent neuroradiologists.

The safe and effective use of the DuraSeal Sealant for its intended use is supported by the findings of this study.

## DIRECTIONS FOR USE

### Polymer Kit Mixing Instructions

#### Note:

- Inspect the PEG powder vial to ensure the powder is free flowing, or can be loosened up by shaking. If the powder remains not free-flowing, discard the entire kit.

- Open the sterile tray. Remove the contents from the tray and introduce into the sterile field.

- Pierce the vial seal on the powder vial by pushing the syringe/stopcock into the vial cap. The vial seal is completely pierced when the vial luer neck is recessed into the vial cap and a "click" is noted; twisting is not required. Avoid pushing the syringe plunger.



- Rotate the stopcock to the open position, and inject syringe contents into the vial.



- Note:** if fluid is leaking from the vial/syringe assembly, discard the entire polymer kit.

- Gently shake the vial/syringe assembly until the powder is completely dissolved. The solution will turn blue.



- Invert the vial/syringe assembly, and draw the vial contents back into the syringe.



- Unscrew the syringe from the vial/stopcock assembly and discard the vial/stopcock assembly.



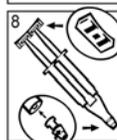
### Applicator Preparation (Assembly and Priming)

- Prior to attaching the syringes to the applicator, ensure syringe fluid levels are equal. If fluid levels are not equal, expel fluids out of syringes until equal.

- Attach blue and clear precursor syringes to the applicator.



- While holding the syringes by the plungers, carefully attach the plunger cap to the plungers of both syringes without dispensing precursors into the applicator.



#### Note:

Avoid touching the plunger cap before application to avoid inadvertent precursor injection and tip plugging

- Attach a spray tip to the applicator.

### Hydrogel Application

#### Note:

- Achieve hemostasis and minimize CSF outflow. Ensure that 2-3 mm margins around the durotomy edge are clear of clots and fluids, hemostatic agents and loose connective tissue.

- Position the applicator 2-4 cm from the target site. Apply firm even pressure to the center of the plunger cap to dispense the precursors. Rapid initial spraying, followed by a slower controlled rate is recommended.

- Continue applying the hydrogel until a thin (1 – 2 mm) coating is formed.

**Note:** If delivery is interrupted and the spray tip is plugged, remove the spray tip, wipe the applicator tip, attach a new spray tip and continue delivery.

**Note:** The blue color of the hydrogel aids in gauging thickness. As the thickness of the DuraSeal hydrogel increases to 2 mm, the fine epidural vasculature becomes less visible.

- Excess DuraSeal hydrogel may be removed with scissors or mechanical disruption. Irrigation immediately after the sealant has solidified is permitted.

### STORAGE

The DuraSeal Dural Sealant System should be stored at or below 77 °F (25°C).

### SYMBOLS USED ON LABELING

Do not reuse Lot Number

REF Catalog Number

Use by – year and month

Latex Free

See Instructions for Use



Store below 25° C (77 °F)



Sterile unless the package is damaged or open.  
Method of sterilization – Radiation

**R<sub>x</sub> only** Caution: Federal law (USA) restricts this device to sale by or on the order of a physician.

For more information, or to obtain Confluent Surgical documents or references, contact:  
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DuraSeal is a trademark of Confluent Surgical, Inc.

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