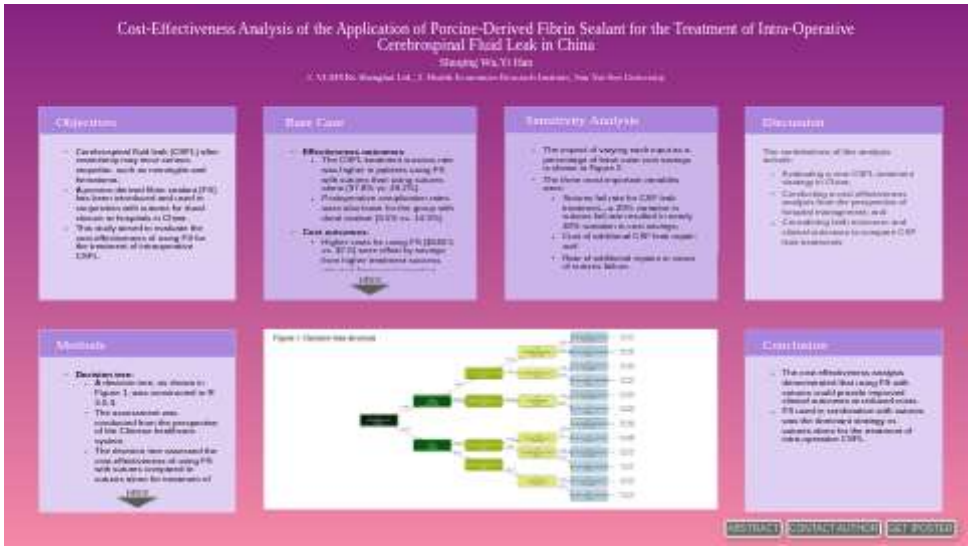
Cost-Effectiveness Analysis of the Application of Porcine-Derived Fibrin Sealant for the Treatment of Intra-Operative Cerebrospinal Fluid Leak in China



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PRESENTED AT:

OBJECTIVES

- Cerebrospinal fluid leak (CSFL) after craniotomy may incur serious sequelae, such as meningitis and hematoma.
- A porcine-derived fibrin sealant (FS) has been introduced and used in conjunction with sutures for dural closure at hospitals in China.
- This study aimed to evaluate the cost-effectiveness of using FS for the treatment of intraoperative CSFL.

BASE CASE

- **Effectiveness outcomes**:
  - The CSFL treatment success rate was higher in patients using FS with sutures than using sutures alone (97.8% vs. 49.2%).
  - Postoperative complication rates were also lower for the group with dural sealant (9.5% vs. 14.3%).
- **Cost outcomes:**
  - Higher costs for using FS ($248.5 vs. $7.6) were offset by savings from higher treatment success rate and lower post-operative complication rates.
  - The FS group saved $375.0 in additional CSFL repairs compared to the sutures group ($18.1 vs. $393.0), and $66.7 in treatment for complications ($131.9 vs. $198.6).
  - Total costs per patient were lower by $200.8 in the FS plus suture group ($398.5 vs. $599.3).

SENSITIVITY ANALYSIS

- The impact of varying each input as a percentage of base case cost savings is shown in Figure 2.
- The three most important variables were:
  - Sutures fail rate for CSF leak treatment—a 20% variation in sutures fail rate resulted in nearly 40% variation in cost savings;
  - Cost of additional CSF leak repair; and
  - Rate of additional repairs in cases of sutures failure.

DISCUSSION

The contributions of this analysis include:

- Evaluating a new CSFL treatment strategy in China;
- Conducting a cost effectiveness analysis from the perspective of hospital management; and
- Considering both economic and clinical outcomes to compare CSF leak treatments

METHODS

- **Decision tree:**
  - A decision tree, as shown in Figure 1, was constructed in R 3.6.3.
  - The assessment was conducted from the perspective of the Chinese healthcare system.
  - The decision tree assessed the cost-effectiveness of using FS with sutures compared to sutures alone for treatment of intra-operative CSFL
- **Input data and outcomes**:
  - Efficacy and safety information were extracted from a randomized, single-blinded clinical trial comparing the two interventions (NCT03110783).
  - Costs were obtained through the analysis of real-world databases of provincial procurement costs. All costs were converted to USD based on the published exchange rate on 12/23/2020 (6.5400 RMB to 1 USD).
  - The effectiveness of the interventions was measured both as the success rate of CSFL treatment and as the reduction of postoperative complications.
- **Sensitivity analysis**:
  - A univariate sensitivity analysis assessed the impact of increasing and decreasing each variable by 20%.
  - Probabilities were truncated to 1 if a 20% increase resulted in values larger than one.

Figure 1. Decision tree structure

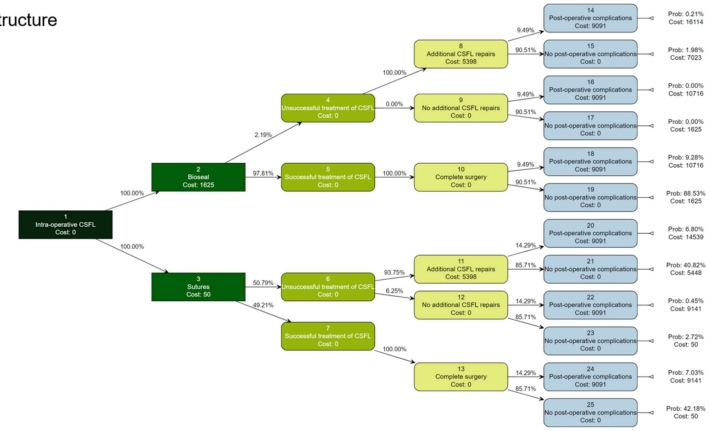
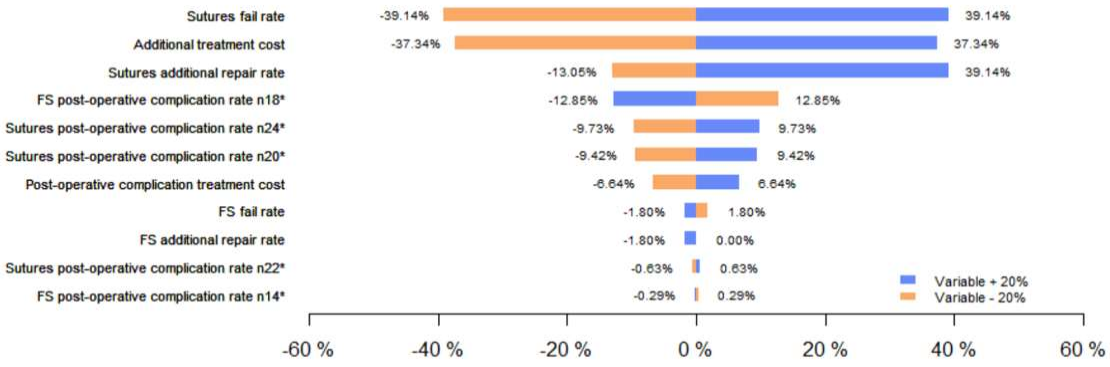


Figure 2. Tornado plot of univariate sensitivity analysis



*n14, 16, 18, 20, 22, 24 refer to nodes numbered correspondingly in Figure 1.

CONCLUSION

- The cost effectiveness analysis demonstrated that using FS with sutures could provide improved clinical outcomes at reduced costs.
- FS used in combination with sutures was the dominant strategy vs sutures alone for the treatment of intra-operative CSFL.

ABSTRACT

Cost-effectiveness analysis of the application of porcine-derive fibrin sealant for the treatment of intra-operative cerebrospinal fluid leak in China

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Objectives: Cerebrospinal fluid leak (CSFL) after craniotomy may incur serious sequelae, such as meningitis and hematoma. A porcine-derived fibrin sealant (FS) has been introduced and used in conjunction with sutures for dural closure at hospitals in China. This study aimed to evaluate the cost-effectiveness of using FS for the treatment of intraoperative CSFL.

Methods: A decision tree was constructed in R 3.6.3 to assess the cost-effectiveness of using FS with sutures compared to sutures alone for treatment of intra-operative CSFL from the perspective of the Chinese healthcare system. Efficacy and safety information were extracted from a randomized, single-blinded clinical trial comparing the two interventions (NCT03110783). Costs were obtained through the analysis of real-world databases of provincial procurement costs. All costs were converted to USD based on the published exchange rate on 12/23/2020 (6.5400 RMB to 1 USD). The effectiveness of the interventions was measured both as the success rate of CSFL treatment and as the reduction of postoperative complications.

Results: The CSFL treatment success rate was higher in patients using FS with sutures than using sutures alone (97.8% vs. 49.2%). Postoperative complication rates were also lower for the group with dural sealant (9.5% vs. 14.3%). Higher costs for using FS ($248.5 vs. $7.6) were offset by savings from higher treatment success rate and lower post-operative complication rates. The FS group saved $375.0 in additional CSFL repairs compared to the sutures group ($18.1 vs. $393.0), and $66.7 in treatment for complications ($131.9 vs. $198.6). Total costs per patient were lower by $200.8 in the FS plus suture group ($398.5 vs. $599.3).

Conclusion: The cost effectiveness analysis demonstrated that using FS with sutures could provide improved clinical outcomes at reduced costs. FS used in combination with sutures was the dominant strategy vs sutures alone for the treatment of intra-operative CSFL.