Results: Comparing the time of surgery (DS: 10.8 min. vs AD: 9.8 min.) and the quality of the defect regarding the diameter and the circularity of the osteotomies, no significant difference could be seen between the two techniques. However, due to the fact that AD disengages automatically the drilling process as soon as it does not encounter anymore resistance, the underlying dura mater integrity was shown to be significantly improved compared to DS (Fig. 1C). Another major advantage was the absence of heat produced during the drilling (no irrigation was used), whereas high temperatures were recorded during DS utilization (up to 46°C) which could potentially damage bone and peripheral tissues (Fig. 1D).

Discussion and Conclusion: The current state of the art method for cranial osteotomy is a trephine and burr. As shown in this study, the risk of damaging the dura mater using this method is relatively high. Several studies have shown that DM is critical in calvarial re-osification by providing cellular element such as osteoblasts and growth factors [1]. and impairing DM results in altered bone regeneration. Consequently, the use of a new device enables to create reproducible calvarial defects in a satisfying surgical time with minimal effect of the surrounding tissues would be of major interest. In this investigation, we demonstrated that the use of Anspach high speed handheld drill is a safe, efficient, precise and fast method for creating circular defects in rabbit cranium.

References

Funding/support: NSFC-DG-RTD Joint Scheme (Project No. S13611330034), the European Union’s 7th Framework Program under grant agreement n° NMP3-SL-2013-604517 and DepuySynthes.

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CHITOSAN/PVA/BIOGlass MULTILAYER FILMS FOR WOUND DRESSING APPLICATION
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Background: Wound healing is a dynamic process in which a variety of cellular and matrix components act in concert to re-establish the integrity of injured tissue, and it was widely accepted that a moist wound free of infection provides an optimal microenvironment beneficial to continuous tissue repair processes. To create a moist environment for rapid wound healing, a chitosan/PVA/ Bioglass multilayer film with sustained antibacterial capacity had been developed by electrosprining. This triple-layer film consists of a PVA-Bioglass top layer and chitosan sublayer separated by a PVA-chitosan blended layer, which assumed that the sub-layer would contact the wound surface, promote tissue regeneration. The mid-layer, with moisture retention and antimicrobial agents, could prevent bacterial invasion and control water vapor evaporation, and the top-layer with bioglass would release beneficial ions which promote self-healing.

Subjects and Methods: The nano-Bioglass (nBG), with a composition of 80%SiO2/16%CaO/4%P2O5 (mol %), were prepared using a base-catalyzed sol–gel method. The fibrous films were prepared using the electrosprining technique (Figure 1A). The nBG were added at varying contents (5, 10, 20, and 40 wt% nBG (with respect to polymer weight) were separately prepared under magnetic stirring. 5, 10, 20 and 40 wt% nBG (with respect to polymer weight) were first dispersed in 10 wt% PVA solutions. The prepared composite polymer solutions were then electrosprining.

Results: Chitosan and PVA films have been successfully prepared by electrosprining. The average fibre diameter is 400–800 nm. The nBG were added at varying contents (5, 10, 20, and 40%) to PVA solution in order to generate top-layer of the multilayer films. The SEM images of the resulting fibers clearly showed that the nBG nanoparticles were well distributed in the polymer matrix (Figure 1B). TG analysis suggested that the PVA organic matrix was completely burnt out below 600°C (Figure 1C). However, the nBG added films showed remnant weights after ~400°C. The remnant weights increased with increasing nBG content, which matching the designed contents. Furthermore, the capacity of the multilayer films to heal full-thickness skin defects was evaluated in a rodent model. The result showed that the wounds of treated groups had almost closed by day 12 whereas the untreated wounds were not, indicating that the multilayer films can significantly promote the wound healing.

Discussion and Conclusion: An ideal wound dressing, therefore, should protect the wound from bacterial infection and maintain a moist healing environment. Hence, an attempt was made to design a three-layered composite film to meet the divergent demands of the healing process. Firstly, chitosan (CS) was selected as the sub-layer because of its extremely biocompatibility and antibacterial properties. The mid-layer contained PVA and chitosan was established by dual-channel mixed electrosprinning. PVA is a hydrophilic biodegradable polymer which could maintain a moist healing environment. For top-layer, bioglass was successfully incorporated in PVA fibers. One of the important characteristics of bioactive glasses is their ability to release beneficial ions, which promote self-healing. In conclusion, the results obtained in this work indicated that the new type of multilayer films has the potential for wound dressing application.
ROLE OF FGFR2 IN CALVARIAL DEFECT HEALING
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Introduction: FGFR2 is an important member of the FGFRs family, many studies have shown that FGFR2 plays an important role in bone development. Calvarial defect healing is a complicated regeneration process which to some degree recapitulates the skull development. Many molecules involved in skull development also play important roles during calvarial defect healing such as Wnts, FGFs, BMPs, etc. Given that FGFR2 plays an important role in skull development, we speculate FGFR2 may participate in the regeneration process after calvarial defect healing. Many molecules involved in skull development, such as Wnts, FGFs, BMPs, etc., also play important roles during calvarial defect healing such as Wnts, FGFs, BMPs, etc. Given that FGFR2 plays an important role in skull development, we speculate FGFR2 may participate in the regeneration process after calvarial defect healing. In this study, we tested the hypothesis that FGFR2 plays an important role in calvarial defect healing.

Subjects and Methods: Calvarial defects were established in FGFR2P253R/+ mice. Micro-CT was used to calculate the volume of bone defect, and HE staining was used to examine the bone formation. Quantitative PCR was used to detect the mRNA levels of canonical Wnt/b-catenin pathway genes (Wnt, b-catenin, Tcf1). Western blot was used to examine the protein levels of canonical Wnt/b-catenin signaling pathway.

Results: Micro-CT and HE staining results show that FGFR2P253R/+ mice have accelerated defect healing ability. The proliferation and differentiation of FGFR2P253R/+ osteoblasts were accelerated. The expression of bone formation markers such as Runx2, Coll and OP were increased, and the activity of ERK1/2 pathway was enhanced in FGFR2P253R/+ osteoblasts. The mRNA levels of canonical Wnt/b-catenin pathway genes (Wnt, b-catenin, Tcf1) were increased in FGFR2P253R/+ osteoblasts. FGFR2 promotes calvarial defect healing. FGFR2 accelerates the proliferation of osteoblast cells, and promotes the differentiation of osteoblasts by up-regulating Runx2 and partially through ERK1/2 MAPK pathway. FGFR2 accelerates osteoblasts differentiation partly by activating the canonical Wnt/b-catenin signaling pathway.

Conclusion: FGFR2 is an important member of the FGFRs family, many studies have shown that FGFR2 plays an important role in bone development. Calvarial defect healing is a complicated regeneration process which to some degree recapitulates the skull development. Many molecules involved in skull development also play important roles during calvarial defect healing such as Wnts, FGFs, BMPs, etc. Given that FGFR2 plays an important role in skull development, we speculate FGFR2 may participate in the regeneration process after calvarial defect healing. In this study, we tested the hypothesis that FGFR2 plays an important role in calvarial defect healing. FGFR2 promotes calvarial defect healing. FGFR2 accelerates the proliferation of osteoblast cells, and promotes the differentiation of osteoblasts by up-regulating Runx2 and partially through ERK1/2 MAPK pathway. FGFR2 accelerates osteoblasts differentiation partly by activating the canonical Wnt/b-catenin signaling pathway.