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☐ Initial submission ☐ Revised version ☒ Final submission

Life Sciences Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form is intended for publication with all accepted life science papers and provides structure for consistency and transparency in reporting. Every life science submission will use this form; some list items might not apply to an individual manuscript, but all fields must be completed for clarity.

For further information on the points included in this form, see Reporting Life Sciences Research. For further information on Nature Research policies, including our data availability policy, see Authors & Referees and the Editorial Policy Checklist.

Experimental design

1. Sample size

   Describe how sample size was determined.

   The power calculation (rat tibial-growth experiments) distinguished as significant a difference of 60% in the outcome variable between test and control group; 60% estimated standard deviation; p = 0.05; 90% confidence; n = 3. No statistical methods were used to pre-determine the sample size of the piglet heart-valve experiments.

2. Data exclusions

   Describe any data exclusions.

   In the rat tibial-growth model, four animals received a growth-accommodating device with a degradable ESPGS core. One of these animals was excluded from the analysis due to development of a wound infection, which could have significantly impacted bone growth.

3. Replication

   Describe whether the experimental findings were reliably reproduced.

   Attempts at replication were successful. Statistical analyses were performed to illustrate significance.

4. Randomization

   Describe how samples/organisms/participants were allocated into experimental groups.

   The experiments did not use a method of randomization.

5. Blinding

   Describe whether the investigators were blinded to group allocation during data collection and/or analysis.

   The investigators were not blinded to group allocation during data collection and analysis.

Note: all studies involving animals and/or human research participants must disclose whether blinding and randomization were used.

6. Statistical parameters

For all figures and tables that use statistical methods, confirm that the following items are present in relevant figure legends (or in the Methods section if additional space is needed).

n/a	Confirmed
☐	☒ The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement (animals, litters, cultures, etc.)
☐	☒ A description of how samples were collected, noting whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒ A statement indicating how many times each experiment was replicated
☐	☒ The statistical test(s) used and whether they are one- or two-sided (note: only common tests should be described solely by name; more complex techniques should be described in the Methods section)
☐	☒ A description of any assumptions or corrections, such as an adjustment for multiple comparisons
☐	☒ The test results (e.g. *P* values) given as exact values whenever possible and with confidence intervals noted
☐	☒ A clear description of statistics including central tendency (e.g. median, mean) and variation (e.g. standard deviation, interquartile range)
☐	☒ Clearly defined error bars

See the web collection on statistics for biologists for further resources and guidance.

Software

Policy information about availability of computer code

7. Software

Describe the software used to analyze the data in this study.	All statistical analyses were performed with StatPlus® software (AnalystSoft Inc.).

For manuscripts utilizing custom algorithms or software that are central to the paper but not yet described in the published literature, software must be made available to editors and reviewers upon request. We strongly encourage code deposition in a community repository (e.g. GitHub). *Nature Methods* guidance for providing algorithms and software for publication provides further information on this topic.

Materials and reagents

Policy information about availability of materials

8. Materials availability

Indicate whether there are restrictions on availability of unique materials or if these materials are only available for distribution by a for-profit company.	No unique materials were used.

9. Antibodies

Describe the antibodies used and how they were validated for use in the system under study (i.e. assay and species).	No antibodies were used.

10. Eukaryotic cell lines

a. State the source of each eukaryotic cell line used.	No eukaryotic cell lines were used.
b. Describe the method of cell line authentication used.	No eukaryotic cell lines were used.
c. Report whether the cell lines were tested for mycoplasma contamination.	No eukaryotic cell lines were used.
d. If any of the cell lines used are listed in the database of commonly misidentified cell lines maintained by ICLAC, provide a scientific rationale for their use.	No commonly misidentified cell lines were used.

Animals and human research participants

Policy information about studies involving animals; when reporting animal research, follow the ARRIVE guidelines

11. Description of research animals

Provide details on animals and/or animal-derived materials used in the study.

To demonstrate proof-of-principle of autonomous device elongation and tissue-growth accommodation in an in vivo environment, a rat tibial-bone-growth model was developed. Young, growing male Wistar rats (150-200g) underwent surgical implantation of a device prototype along the left tibia, analogous to conventional implants used to guide bone growth in children, and were kept alive for eight weeks.

We further explored the use of the device on tissues in a more dynamic environment, namely, the heart valve in a growing piglet model. In this preliminary study, four growing, female Yorkshire piglets (mean age 7.3 ± 0.9 weeks) underwent surgical implantation of a growth-accommodating annuloplasty ring prototype on the tricuspid valve, and were kept alive for 5, 12, 16, and 20 weeks to assess device behavior and valve growth.

Both experimental animal protocols were approved by the Boston Children's Hospital Institutional Animal Care and Use Committee (IACUC). All animals received humane care in accordance with the 1996 "Guide for the care and use of laboratory animals" recommended by the US National Institutes of Health.

Policy information about studies involving human research participants

12. Description of human research participants

Describe the covariate-relevant population characteristics of the human research participants.

The study did not involve human research participants.