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REVIEW

Laboratory animal research published in plastic surgery journals in 2014 has extensive waste: A systematic review

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Summary   Laboratory animal research must be designed in a manner that minimizes bias if it is to yield valid and reproducible results. In 2009, a survey that examined 271 animal studies found that 87% did not use randomization and 86% did not use blinding. This has been called "research waste" because it wasted time and resources. This systematic review measured the quantity of research waste in plastic surgery journals in 2014.
Method: The PRISMA-P protocol was used. SCOPUS and PubMed searches were done for all animal studies published in 2014 in *Aesthetic Plast Surg, Aesthet Surg J, Ann Plast Surg, JPRAS, J Plast Surg Hand Surg* and *Plast Reconstr Surg*. These were supplemented by manual searches of the 2014 issues not indexed. Articles were analyzed for descriptions of randomization, randomization methodology, allocation concealment, and blinding of the primary outcome assessment. Corresponding authors who mentioned randomization without elaborating were emailed for details.
Results: 112 of 154 articles met the inclusion criteria. Only 24/112 (21.4%) had blinding of the primary outcome measure, 28/110 (25.5%) of articles that required randomization mentioned it. While 12/28 articles clearly described randomizing the intervention, only 4/28 described the method of randomization, and 2/28 mentioned allocation concealment. Only two authors responded and described the randomization methodology.
Conclusion: The quality of plastic surgery laboratory animal research published in 2014 was poor. Use of the National Centre for the Replacement Refinement & Reduction of Animals in Research's "Animal Research: Reporting In Vivo Experiments" (ARRIVE) Guidelines by authors, and enforcement of them by editors and reviewers could improve research quality and reduce waste.
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Introduction

Plastic surgeons use laboratory animals to test hypotheses in order to improve patient care. Research must be designed in a logical manner that minimizes bias if it is to yield valid and reproducible results. Randomized blinded studies are the best means of accomplishing this as they lessen bias. In 2009, the need to improve the quality of all animal research was demonstrated by a survey that examined 271 studies from the US and UK, 90% of which had been funded by either charitable or government sources. The survey found that 87% of studies did not use randomization and 86% did not use blinding.[1] This lost opportunity has been called "research waste" because it wasted time and resources.[2] The aim of this systematic review was to measure the current quantity of laboratory animal research waste in plastic surgery journals by reviewing studies published in 2014.

Methods

The PRISMA-P protocol for systematic reviews was used.[3] Ovid and PubMed searches of the MEDLINE database were done for all animal studies published in 2014 in *Aesthetic Plast Surg, Aesthet Surg J, Ann Plast Surg, JPRAS, J Plast Surg Hand Surg* and *Plast Reconstr Surg.*

Searches were done on 11/15/2014, 12/31/2014, 03/01/2015 and 03/21/2015. The searches were supplemented by manual searches of the six named journals for all 2014 issues. Editorials, reviews, commentaries, letters and non-hypothesis driven articles were excluded. Articles were analyzed for descriptions of randomization of intervention, randomization methodology, allocation concealment, and blinding of assessment of the primary outcome. The grey literature that consisted of meeting abstracts was excluded because even when articles described randomization methodology, allocation concealment, and blinding of assessment of the primary outcome, the respective abstracts did not. The author extracted the data and repeated the data extraction eight weeks later in order to increase the probability of accurate data extraction, while decreasing the probability of recall bias. Corresponding authors who mentioned randomization were emailed for further information about their methodology if it was not described. Figure 1 contains the attrition flow chart.

Results

112 of 154 articles met the inclusion criteria. (Appendix 1) The two articles that studied diagnostic test accuracy were not required to randomize as suggested by the Quality Assessment of Diagnostic Accuracy Studies (QUADAS-II) tool, but neither article blinded the evaluators to the comparative test results.[4] Only one article described its randomization methodology, and had both allocation concealment and blinding of the primary outcome.[5] Only two of the authors contacted who mentioned randomization responded and described their methodology. The remaining findings are in Table 1.
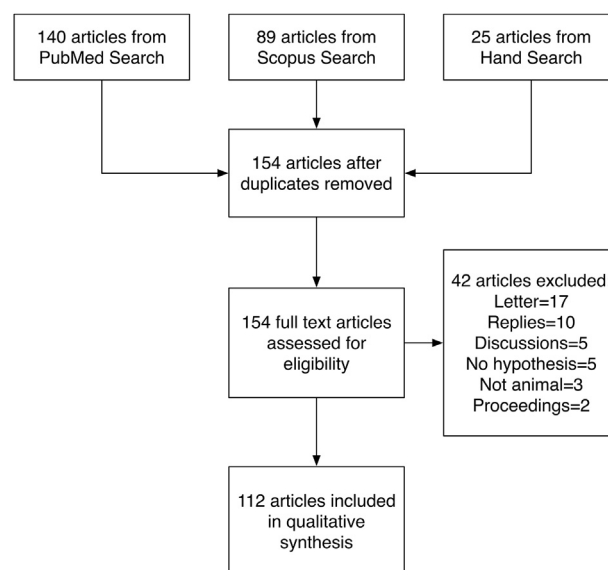
Figure 1   PRISMA type attrition flow chart for 2014 plastic surgery animal research. The PubMed search string was: (((("Journal of plastic, reconstructive & aesthetic surgery: JPRAS" [Journal] OR "Annals of plastic surgery" [Journal]) OR "Aesthetic surgery journal/the American Society for Aesthetic Plastic surgery" [Journal]) OR "Aesthetic plastic surgery" [Journal]) OR ("Plastic and reconstructive surgery" [Journal] OR "Journal of plastic surgery and hand surgery" [Journal])) AND ("2013/12/15" [CRDAT]: "3000" [CRDAT]) AND "animals" [MeSH Terms:noexp].

Discussion

Laboratory animals are used to test hypotheses in order to understand normal biology, enhance patient care by understanding disease pathogenesis, improving diagnostic measures and determining safety and effectiveness of various interventions. As animal research is prospective, it provides the ideal opportunity to test hypotheses in a logical manner that minimizes bias if it is to yield valid and reproducible results. Randomized blinded studies are the best means of accomplishing this as they lessen bias. As every article reviewed had more than one author, it was feasible for the research to have been designed with proper allocation concealment and outcome blinding to minimize bias, yet only one did so. The low response by only 2 corresponding authors for details of randomization

Table 1   Results of a Systematic Review of Laboratory Animal Research Published in Plastic Surgery Journals in 2014. Randomization was not required for 2 studies of diagnostic accuracy.

	Yes	No
Randomization mentioned	28	82
Randomization of intervention	12	16
Randomization methodology described	4	24
Allocation concealment described	2	26
Blinding of the primary outcome assessment	24	88