



Predatory journals: a major threat in orthopaedic research

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Abstract

Predatory publishing is a major threat to contemporary publishing, as it offers 'to unaware scientist's', a quick open-access publication against fees without peer-review procedures.. Lack of peer-review leads to unethical practices, as plagiarism, publication of unscientific falsified data, and even unsafe clinical practices. As these journals threaten the credibility of academic publishing, significant work has been done from many scientific teams, in the last years, in establishing discriminating criteria between predatory and legitimate publishing. In the present review, we include mechanisms used by predatory editors to convince eager researchers to submit to their journals. We also provide useful links giving information about potential predatory journals and publishers, as well as scholarly writing. Joining the efforts of different scientific disciplines which compiled “green” lists with journals in their field, we conducted a “green” list with genuine orthopaedic research journals based on the directory of open-access journals (DOAJ) and Thomson Reuters journal citation reports. Ninety-six legitimate orthopaedic journals were identified based on the Thomson Reuters journal citation reports. One hundred thirty hits were found on the DOAJ site using the keywords “orthopaedics, orthopedics, sports medicine, musculoskeletal, trauma, traumatology, osteoarthritis, osteoporosis, cartilage, bone, hand, shoulder, knee, hip, foot, wound.” Twenty-one journals on the DOAJ site occurred overlapping with keywords. Researchers and clinicians in the field of orthopaedics are advised to use all available tools in order to recognize predatory practices and avoid publishing in predatory journals.

Keywords Predatory journals · Legitimate publishing · Open access

Historical background

The first written documents of orthopaedic surgery reach back into the sixteenth century BC. Numerous years later, in the beginning of the nineteenth century, first scripts on

orthopaedic surgery therapy regimes and treatment options were randomly published in different trade journals. In 1884 in Germany, the “Centralblatt der orthopädischen Chirurgie” was the first academic and orthopaedic specialized journal that was established, while in 1889, the American Orthopedic Association publishes for the first time the Journal of Bone and Joint Surgery [1, 2].

Just about 27 years ago, a new and innovative form of dissemination of knowledge via the internet has occurred. The world's first e-print document server arXiv, a provider of only physical literature, was established in 1991 by Paul Ginsparg [3]. This was the beginning of the open-access era. In 2002, the *Budapest Open Access Initiative* and in 2003, both the *Bethesda statement* and the *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities* developed recommendations to ensure wide distribution as well as free-open access of literature to all users [4–6]. Open access (OA) was defined as free and unrestricted online availability that provided visibility, broad readership, and an increased impact of research results by removing price barrier, such as subscription fees and licensing restrictions.

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In the last decade, there has been an enormous increase in a thriving “*black-market economy of publishing scams*” in OA journals using article-processing charges (APC), termed “predatory journals” [7].

In the present review, we summarize the existing literature on predatory journals with special emphasis given on their impact on biomedical publishing and especially on orthopaedic research.

What is predatory publishing?

Predatory journals exist for the sole purpose of making a profit and are designated to look like genuine scholarly journals [7]. They are fake or trash journals that send deceiving emails encouraging authors to submit their work to OA journals, collecting APC.

A typical beginning of an invitation from a predatory journal is as follows: “*Greetings! We came across your scientific contribution and we with an immense interest, invites you for a valuable contribution for our next issue.*” Using bad English, they ask researchers to publish their work within the next few days, promising acceptance of the submitted research paper after a fast peer-review process [8, 9]. Quite often, these invitation emails contain a high praise for an already published article in a proper journal.

Predatory journals use questionable marketing schemes, often impersonating existing journals or using a similar-sounding title and a similar webpage. They pretend to have peer-review procedures and promise quick OA publication, while the articles are published even without permission from the author [8]. As there is no quality control, they fail to provide scientific transparency, which results in corrupting the communication of science and allowing questionable science to be published [10, 11]. Predatory journals do not follow standard policies regarding archiving of journal content, misprinting errors, or management of conflicts of interest recommended by organizations, such as the WAME (World Association of Medical Editors), the International Committee of Medical Journal Editors (ICMJE), the Committee on Publication Ethics (COPE), and the Council of Science Editors (CSE) [12]. They claim to be indexed, but they are not indexed in the major databases such as PubMed, Web of Science, or Scopus, with the exception of Google Scholar. These bogus journals often allege to have “impact factors” when in fact they do not have a Thomson Reuters impact. They often include into the journal title terms like “international, global, or universal” in order to be attractive to authors who need to publish in an international journal [10].

Predatory publishing is, therefore, an opportunistic publishing that exploits the need of unexperienced researchers to publish and not perish in the academic setting [13]. To that

end, we performed a search in PubMed using the term “predatory journals” which gave 210 hits starting in 2012, emphasizing the concern of the academic community in this new threat in academic publishing.

A very interesting publication by Shen et al. (2015) answered the questions of the current number of predatory journals, the number of articles published, the origin of the countries publishing in predatory journals, and the countries of the authors, as well as the cost in publishing in predatory journals. According to this report, the number of articles published by predatory journals increased from 53,000 in 2010 to around 420,000 in 2014, appearing in 8000 journals. In addition, the authors reported that three quarters of corresponding authors and publishers were from Asia and Africa, while the percentage of European and North American publishers reached 8.8% and 17.5%, respectively [14].

In addition, Machacek et al. performed an analysis of publications in Scopus from 2013 to 2015 and found that over 10% of publications in predatory journals were from India and Nigeria, compared to less than 1% that were from Japan and the USA. However, an interesting finding was that although most of the articles in predatory journals were from India, surprisingly, more than half of the authors were from middle- or high-income countries [15]. However, it is not known whether these authors submitted their manuscripts in predatory journals by mistake, assuming that the journal is a legitimate one [16].

Discriminating between legitimate and predatory journals: Beall’s contribution

There is no doubt that the best way to recognize predatory publishers is through education and scientific literacy [11]. The 5th World Congress of Research Integrity, which was held in Amsterdam in May 2017, organized a symposium dedicated on predatory journals in an effort to expose the harm they cause to science and to discuss about possible actions that need to be taken to stop “predatory” publishing [17]. In medical research, editors proceeded with establishing criteria for best practices for scholarly publishing [18, 19]. Regarding scholarly publishing, many publishers, journals, and different organizations formed an alliance named “think-check-submit” in an effort to inform scientists on how to discriminate between legitimate and predatory journals [20]. In addition, the US National Library of Medicine (MEDLINE) has published a fact sheet that provides the world’s biomedical journals based on critical elements, such as scope and coverage, type of content, quality of content, and production and editorial work as well as audience [21].

Pioneer work in the issue of discriminating between predatory and legitimate publishing has been done, since 2009 by Jeffrey Beall, an associate professor of Library Science in

University of Denver, Colorado, who first coined the term “predatory publishers and journal” [10, 11]. Beall established a list of criteria that define “*potential, possible or probable predatory*” publishers. Beall’s discriminating criteria were mainly based on the Committee on Publication Ethics (COPE), the Code of Conduct for Journal Editors, the membership criteria of the OA Scholarly Publisher’s Association (OASPA), and the Principles of Transparency and Best Practice in Scholarly Publishing from COPE and WAME. According to Beall, in order to identify predatory journals, scientists must pay attention to the editor and the review board members of the journals, the publisher, and the general integrity of each journal [22–24]. In the last 4 years, the number of predatory journals has increased by 600% and Beall suggested banning predatory journals from the scientific record [25].

He used his criteria in compiling a “blacklist” of journals to be avoided; however, for unknown reasons, this list was suddenly removed from the Internet in January 2017 [26]. Recently, blacklists of journals have become available by commercial companies. However, paid access to these blacklists limits their use especially by researchers in low-income countries [27, 28].

Another substantial effort in distinguishing bogus journals from legitimate ones was carried out by the Directory of OA Journals (DOAJ). The DOAJ is a service that follows specific selection criteria for indexing high-quality, peer-reviewed OA journals [12]. In January 2017, DOAJ conducted a “white list” with 9456 legitimate OA journals from 128 countries. However, as this list does not include all legitimate OA journals, a journal that is not included should not be assumed to be predatory [29].

A third approach in the effort of identifying and avoiding predatory journals is the previously mentioned “think, check, submit” checklist developed by a coalition of scholarly publishing organizations. This useful checklist is available in the following website <http://thinkchecksubmit.org> and provides useful information for authors to consider when deciding which journal to select for their publication. The checklist includes certain characteristics that must be easily identified as whether the journal is known, if the publisher can be identified and contacted, what is the type of peer-review used, whether the journal is indexed, what is the exact amount of fees, whether the editorial board is identifiable, if there is a website, and if the publisher is a member of a recognized initiative, e.g., the committee on Publication ethics (COPE) or the Directory of OA Journals (DOAJ) [20, 30].

Shamseer et al. in a cross-sectional comparison between potential predatory and legitimate (based on MEDLINE) OA and subscription-based journals proposed 13 characteristics of predatory journals, which can be very useful for young and established researchers. They demonstrated that predatory journals offer 18-fold lower article-processing fees than legitimate ones and that the majority of them were not indexed in

appropriate databases, as MEDLINE, Web of Science, and Scopus but only in Google Scholar, which is not an indexing database. Furthermore, the authors found that 66% of predatory journals contained spelling mistakes compared to 6% of legitimate ones and that 73% of them had editorial board with members that could not be identified versus 2% in OA and 1% in subscription-based journals [31].

Along the same line, recently, Moher et al. reported that even without Beall’s list, authors must be very careful and able to identify predatory journals based on certain characteristics that they have, as article-processing fees less than US \$150, grammar and spelling mistakes in the invitation letter or their website, lack of focus on their scope, promise of extra rapid publication, and absolute lack of information on manuscript handling [32].

Important website links which provide information about potential predatory journals and publishers as well as scholarly writing and publishing are presented in Table 1.

Predatory publishing: a threat in biomedical science

The exponential increase in biomedical knowledge contributed to the development of new specializations and sub-specializations, giving rise to a huge increase in biomedical scientific journals [33]. Beyond doubt, biomedical research demands hard work and is time consuming [34]. Scientists involved in biomedical research have often other responsibilities, as teaching and/or clinical duties, and are therefore forced to work long hours in order to gather the necessary material for their research. In the case of medical research, collection of human samples or participants, receiving permission from ethical and institutional authorities, performing statistical analysis, writing the manuscript, and submitting it for publication are processes that require long time [35]. In addition, the peer-reviewed process in biomedical journals is also time consuming, as it involves more than one expert in the field of the manuscript, who judge whether or not the research is novel and of impact to biomedical science. This way, misconducted research including plagiarism, which is unethical, can be identified and rejected [36–38].

Moverley et al. showed an increase in the impact factor (IF) of orthopaedic journals [39]. However, this increase does not show improvement as in surgical specialties. The authors refer this to the increase in non-English language articles and basing the IF on citations. However, lower citation rate is associated to surgical procedures compared with high-level of evidence, large sample size, and multicenter studies. This reveals a weakness of the accepted IF as a measure of research quality [40]. However, potential citation reflects on journals’ acceptance rate of articles. This suggests that researchers’ frustration from the IF as a measure and the difficulty of accepting their

Table 1 Website links providing information about potential predatory journals and publishers and about scholarly journals as well as ways to discriminate between legitimate and predatory journals

Website links	Information provided
https://web.archive.org/web/20170111172309/https://scholarlyoa.com/individual-journals/	Archive of Beall's list which provides criteria for determining predatory open-access publishers (3rd edition Jan. 1, 2015) and potential predatory scholarly open-access publishers and journals (Dec. 31, 2016)
http://beallist.weebly.com	After the cessation of Beall's list, an anonymous individual has taken the responsibility of updating its list, with new potential journals and publishers that were not originally listed in Beall's list but may be predatory (Feb. 21 2018)
http://thinkchecksubmit.org	Provides criteria to discriminate predatory journals from legitimate ones
https://doaj.org	Lists of OA journals which meet high quality standards such as peer-review and editorial quality control
https://www.shslibraryguides.org/publish/predatory	Guide to scholarly writing and predatory publishing
http://libguides.wits.ac.za/openaccess_a2k_scholarly_communication/Predatory_Publishers	University of the Witwatersand, Johannesburg, Open Access, Scholarly Communication & Predatory Publishers
http://instr.iastate.libguides.com/predatory	IOWA State University 2017. Guide with information on predatory publishing
https://scholarlykitchen.sspnet.org/2017/07/25/cabells-new-predatory-journal-blacklist-review	Site established by the Society for Scholarly Publishing in 2008 providing information on scholarly publishing and communication along with list of potential predatory journals (not free)
https://www.nlm.nih.gov/pubs/factsheets/jsel.html	Fact Sheet published by the US National Library of Medicine (MEDLINE) providing the world's biomedical journals based on critical elements, such as scope and coverage, type of content, quality of content, production, and editorial work as well as audience
mjl.clarivate.com	Thomson Reuters Web of Science provides a master journal list of legitimate open-access journals

research article by standard journals drove them to publish in native language journals. The same frustration could drive clinical scientists unintentionally toward predatory journals. Alternative metrics beside impact factor might not solve this problem [41].

Nonetheless, Urriutia et al. showed how the country of origin influences the frequency of article citation [42]. The authors showed the top 50 most cited orthopaedic articles in Latin America originated from the USA. Mavrogenis et al. could demonstrate that the USA, Japan, and Germany were the top three ranked countries of origin within the best 100 articles of International Orthopaedics [43]. Predatory journals, as well, have many articles authored by US and European scientists, which might play a role in researcher's decision to submit to these journals.

Predatory journals cause extensive damages to science and especially biomedical research. While peer-reviewed OA publications remain the milestone in scientific communication, publication of research without proper scientific

review is detrimental. Lack of peer-review can lead not only to unethical practices, as plagiarism but also to unscientific falsified data and even unsafe clinical practices [44–46]. Predatory publishing leads to doubtful, unscientific articles polluting biomedical scientific literature. Unfortunately, easy and without peer-review publication process could be tempting to academic society, especially to young researchers in non-tenure positions, who are eager to publish a lot and quickly under the pressure of a very competitive academic landscape [47]. Predatory journals, therefore, offer them the advantage of fast and easy processes compared to the time-consuming publication in legitimate journals. The threat of predatory journals to the scientific community is immense, as actually, research that is not read is lost [48–50]. However, knowledge of standards and rules of medical writing often would avoid hopeless efforts trying to get badly written research papers published in established journals. For that purpose, guidance, which is especially helpful for young researchers, is provided in literature [51] and at congresses [52].

Table 2 Legitimate Journals in the field of orthopedics and traumatology based on Clarivate Analytics (former Thomson Reuters) journal citation reports

	Journals based on Thomson Reuters journal citation reports	Publisher
1	Acta Chirurgiae Orthopaedicae et Traumatologiae Cechoslovaca	Galen Sro
2	Acta Orthopaedica	Taylor & Francis Ltd.
3	Acta Orthopaedica Belgica	Acta Medica Belgica
4	Acta Orthopaedica et Traumatologica Turcica	Turkish Assoc. Orthopaedics Traumatology
5	Acta Ortopedica Brasileira	Atha Comunicacao & Editora
6	Advances in Skin & Wound Care	Lippincott Williams & Wilkins,
7	Advances in Wound Care	Mary Ann Liebert
8	American Journal of Sports Medicine	Sage Publications Inc.
9	Archives of Orthopaedic and Trauma Surgery	Springer
10	Archives of Osteoporosis	Springer London Ltd.
11	Arthritis & Rheumatology	Wiley
12	Arthritis Care & Research	Wiley
13	Arthritis Research & Therapy	Biomed Central Ltd.
14	Arthroscopy-The Journal of Arthroscopic and Related Surgery	W B Saunders Co-Elsevier Inc.
15	BMC Musculoskeletal Disorders	Biomed Central Ltd.
16	Bone	Elsevier Science Inc.
17	Bone & Joint Journal	British Editorial Soc. Bone Joint Surgery
18	Bone & Joint Research	British Editorial Soc. Bone Joint Surgery
19	British Journal of Sports Medicine	BMJ Publishing Group
20	Burns & Trauma	Biomed Central Ltd.
21	Cartilage	Sage Publications Inc.
22	Chinese Journal of Traumatology	Elsevier Inc.
23	Clinical Biomechanics	Elsevier Sci. Ltd.
24	Clinical Journal of Sport Medicine	Lippincott Williams & Wilkins
25	Clinical Orthopaedics and Related Research	Lippincott Williams & Wilkins
26	Clinical Spine Surgery	Lippincott Williams & Wilkins
27	Clinics in Podiatric Medicine and Surgery	W B Saunders Co-Elsevier Inc.
28	Clinics in Sports Medicine	W B Saunders Co-Elsevier Inc.
29	Current Osteoporosis Reports	Springer
30	Eklemler Hastalıkları ve Cerrahisi-Joint Diseases and Related Surgery	Turkish Joint Diseases Foundation
31	European Spine Journal	Springer
32	Foot & Ankle International	Sage Publications Inc.
33	Foot and Ankle Clinics	W B Saunders Co-Elsevier Inc.
34	Hand Clinics	W B Saunders Co-Elsevier Inc.
35	Hand Surgery & Rehabilitation	Elsevier
36	Handchirurgie Mikrochirurgie Plastische Chirurgie	Thieme Medical Publ. Inc.
37	Hip International	Sage Publications Ltd.
38	Indian Journal of Orthopaedics	Medknow Publications & Media Pvt. Ltd.
39	Injury Prevention	BMJ Publishing Group
40	Injury-International Journal of the Care of the Injured	Elsevier Sci. Ltd.
41	International Journal of Shoulder Surgery	Medknow Publications & Media Pvt. Ltd.
42	International Journal of Lower Extremity Wounds	Sage Publications Inc.
43	International Orthopaedics	Springer
44	International Wound Journal	Wiley
45	Joint Bone Spine	Elsevier France-Editions Scientifiques Medicales Elsevier
46	Journal of Arthroplasty	Churchill Livingstone Inc. Medical Publishers
47	Journal Of Back And Musculoskeletal Rehabilitation	IOS Press
48	Journal of Bone and Joint Surgery-American Volume	Lippincott Williams & Wilkins

Table 2 (continued)

	Journals based on Thomson Reuters journal citation reports	Publisher
49	Journal of Childrens Orthopaedics	British Editorial Soc. Bone Joint Surgery
50	Journal of Foot & Ankle Surgery	Elsevier Science Inc.
51	Journal of Foot and Ankle Research	Biomed Central Ltd.
52	Journal of Hand Surgery-American Volume	W B Saunders Co-Elsevier Inc.
53	Journal of Hand Surgery-European Volume	Sage Publications Ltd.
54	Journal of Hand Therapy	Hanley & Belfus-Elsevier Inc.
55	Journal of Knee Surgery	Georg Thieme Verlag KG
56	Journal of Osteoporosis	Hindawi Ltd.
57	Journal of Orthopaedic & Sports Physical Therapy	J O S P T
58	Journal of Orthopaedic Research	Wiley
59	Journal of Orthopaedic Science	Elsevier Science BV
60	Journal of Orthopaedic Surgery	Sage Publications Inc.
61	Journal of Orthopaedic Surgery and Research	Biomed Central Ltd.
62	Journal of Orthopaedic Translation	Elsevier Science BV
63	Journal of Orthopaedic Trauma	Lippincott Williams & Wilkins
64	Journal of Orthopaedics and Traumatology	Springer-Verlag Italia Srl
65	Journal of Pediatric Orthopaedics	Lippincott Williams & Wilkins
66	Journal of Pediatric Orthopaedics-Part B	Lippincott Williams & Wilkins
67	Journal of Plastic Surgery and Hand Surgery	Taylor & Francis Ltd.
68	Journal of Shoulder and Elbow Surgery	Mosby-Elsevier
69	Journal of Spinal Cord Medicine	Taylor & Francis Ltd.
70	Journal of the American Academy of Orthopaedic Surgeons	Lippincott Williams & Wilkins
71	Journal of Trauma and Acute Care Surgery	Lippincott Williams & Wilkins
72	Journal of Wound Care	MA Healthcare Ltd.
73	Knee	Elsevier Science BV
74	Knee Surgery Sports Traumatology Arthroscopy	Springer
75	Microsurgery	Wiley
76	Operative Orthopadie und Traumatologie	Urban & Vogel
77	Orthopade	Springer
78	Orthopaedic Nursing	Lippincott Williams & Wilkins
79	Orthopaedic Surgery	Wiley
80	Orthopaedics & Traumatology-Surgery & Research	Elsevier Masson
81	Orthopedic Clinics of North America	W B Saunders Co-Elsevier Inc.
82	Orthopedics	Slack Inc.
83	Osteoarthritis and Cartilage	Elsevier Sci. Ltd.
84	Osteoporosis International	Springer London Ltd.
85	Prosthetics and Orthotics International	Sage Publications Ltd.
86	Seminars in Musculoskeletal Radiology	Thieme Medical Publ. Inc.
87	Sicot Journal	EDP Sciences
88	Skeletal Radiology	Springer
89	Spinal Cord	Nature Publishing Group
90	Spine	Lippincott Williams & Wilkins
91	Spine Journal	Elsevier Science Inc.
92	Sportverletzung-Sportschaden	Georg Thieme Verlag KG
93	Surgical Infections	Mary Ann Liebert
94	Therapeutic Advances in Musculoskeletal Disease	Sage Publications Ltd.
95	Unfallchirurg	Springer
96	Zeitschrift fur Orthopadie und Unfallchirurgie	Thieme Medical Publ. Inc.

Table 3 The list includes journals of the DOAJ site which appeared for at least two keywords

Keywords \ Journals	Keywords											
	Orthopaedics	Orthopedics	Sports medicine	Trauma	Traumatology	Osteoporosis	Cartilage	Bone	Hand	Knee	Foot	Wound
Asia-Pacific Journal of Sports Medicine, Arthroscopy, Rehabilitation and Technology												
Journal of Orthopaedics and Allied Sciences												
Journal of Orthopaedics, Trauma and Rehabilitation												
SICOT-J												
Journal of Orthopaedic Case Reports												
Orthopaedic Genius												
EFORT Open Reviews												
Orthopaedic Journal of Sports Medicine												
JBMR Plus												
Advances in Orthopedics												
Medicina												
The Archives of Bone & Joint Surgery												
Bone Reports												
Revista de la Asociación Argentina de Ortopedia y Traumatología												
Acta Orthopaedica et Traumatologica Turcica												
Revista de Osteoporosis y Metabolismo Mineral												
Osteoporosis and Bone Diseases												
Osteoporosis and Sarcopenia												
Bone Research												
Clinical Medicine Insights: Arthritis and Musculoskeletal Disorders												

Predatory publishers target especially biomedical research, as they are aware that biomedical researchers often have research grants and that their publications will be financed by grant money. Sabharwal et al. report that a major aspect for the successful infiltration of predatory journals is the benefits around OA journals [53]. OA journals have a better visibility and reach out for researchers, and result in higher citation possibility from low-income countries. Nonetheless, the number of such journals in orthopaedic surgery is small. Besides, over a third of orthopaedic journals are hybrid offering the opportunity to publish articles as OA again for a paid fee. The study states no quality differences between OA and subscription journals. Since predatory journals are seen in general as OA, this might contribute in their fast spread.

However, as in medicine, the goal of any scientist is to communicate knowledge for the common good; great attention must be paid in order to choose the right journal in order to disseminate the research results.

Taking into consideration the uncontrolled growth of predatory journals especially in medical research, assessing the magnitude of the problem is necessary. It would be of utmost importance, if scientific societies and specialists establish lists with legitimate journals. Such lists have been established for several disciplines, as neurosciences and neurology [54], urology [55], and intensive care [56].

Based on the DOAJ and Thomson Reuters journal citation reports, we compiled green lists with legitimate OA journals in the field of orthopaedics and traumatology. These lists were conducted based on the subject of each journal. The keywords used were “orthopaedics, orthopedics, sports medicine, musculoskeletal, trauma, traumatology, osteoarthritis, osteoporosis, cartilage, bone, hand, shoulder, knee, hip, foot, wound” [57] (Tables 2 and 3).

In conclusion, although predatory publishing did not exist ten years ago, today, it represents a major problem in academic publishing. Academic institutions must educate young researchers on the new threat of predatory publishing, in order for scientists to be alert and aware of this phenomenon, and only then will be able to minimize the escalating impact of predatory publishing. Therefore, it is of ultimate importance that in biomedical research, researchers only publish their work in high-quality peer-reviewed journals, important to their field, and must obey the triad of “think-check-submit” to avoid predatory publishing.

Compliance with ethical standards

Conflict interest The authors declare that they have no conflict of interest.

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