

A Systematic Review of Screw versus Cement-Retained Fixed Implant Supported Reconstructions

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Purpose: Dental implant is an effective and standardized treatment procedure in the healthcare setting. This study presents a comparison of dental implant reconstruction using screw and cement. It explicitly reviews the studies concerning cement and screws dental implants to determine the efficiency of the two.

Patients and Methods: A systematic review was conducted by comprehensively searching electronic literature. The keywords, such as “Screw versus Cement Retained Fixed Implant Supported Reconstructions,” “Screw Retained Fixed Implant,” “Cement Implant” and “Dental Implant” were used for article searching. Twelve studies were included based on the determined inclusion and exclusion criteria.

Results: No significant difference was found between the screw-retained and cemented retained implant supported reconstructions. Dental implants are associated with complications leading to implant failure based on the type of restoration that is being used; cement-retained restoration and screw-retained restoration. The treatment selection must be based on the significance criteria and the tooth condition.

Conclusion: Screw-retained implant-supported reconstructions were found to pose less biological and technological complications. Retention of the tooth is more stable and functional when implantation is selected based on the efficiency of a treatment procedure.

Keywords: dental implant, dental implant reconstructions, screw retained fixed implant, reversible

Introduction

In dental medicine, the implant-supported reconstructions are considered as better treatment options. The evolution of implant designs and surfaces and dental materials have increased the possibilities to achieve a successful and stable treatment outcome. The selection of connection to be used for final restoration for implanting through screw-retained abutment is an important decision concerning implant prosthodontics. The restorative connection may either be cement-retained or screw-retained. The abutments joined through screw-retained restorations can be combined and separated during fabrication.^{1,2} Shadid and Sadaqa state that implant therapy is a high treatment modality with an increasing success rate among single-tooth restorations, partially edentulous, and edentulous patients.²

In recent years, rapid progress is observed in the field of implant dentistry. It is necessary to consider issues regarding different materials and designs used for implants for achieving maximum clinical success. As compared to screw-retained

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restorations, the fabrication used for cement-retained restorations is easier because it involves clinical prosthodontics and conventional laboratory techniques.³ The use of extra components like; fixation screws, plastic sleeves, and laboratory fixation screws makes the screw-retained restorations expensive.² Although screw-retained restorations are costly, they tend to allow predictable retrievability, unlike the cement-retained restorations that may be damaged because of technical or biologic complications. The cement-retained and screw-retained restorations help in achieving predictable esthetics when the dental implant is placed in an ideal position.

The customized abutments are used, when it is difficult to place an implant in an ideal position for relocating screw access channels far from the esthetic area.⁴ Esthetic improvement of the implant restoration uses an opaque material combined with resilient composite. Easy access to the posterior of mouth among patients with limited jaw movement is possible for cement-retained restoration patients. The condition of peri-implantitis imposes worst complications by destroying the peri-implant tissue and bone loss concerned with both cement-retained and screw-retained prosthesis.^{5,6} Weber et al⁷ compared the responses of peri-implant soft tissue between cement-retained and screw-retained restoration. Favorable results in terms of bleeding on probing and low plaque index were obtained for screw-retained restorations as compared to cement-retained restorations.

Whereas, Al-Fahd et al⁵ showed conflicting results concerning the implant reconstruction using a screw and cement-based restorations. Similarly, a systematic study of Sailer et al⁸ showed that cement dental implant poses severe biological complications, which contradicts the results of de Brandao et al⁹ which revealed no difference between the two types of implants. Both studies emphasize the need to provide clear evidence of which type of implant reconstruction is more effective as compared to others. This research is, therefore, an extension, which systematically reviews the outcomes of the two dental implantations.

In the same line of research, various researches have shown an inclination to the cement restoration and recognized it as a versatile implant method in terms of its estheticity, passivity, and improved occlusion control.^{10,11} However, the prospects of cement residue to be present following its restoration are high, harming the permanent tissues.¹¹ Similarly, the significance of screw-retained implant reconstruction is reported effective in terms of its retrievability, oral hygiene, and simpler procedures,¹⁰

though, the loosening of the screw is reflected as a major drawback. The findings, thereby, fail to conclude. To bridge this gap and analyze the effectiveness of the two dental implants, this paper reviews the studies and explicitly determine the efficiency of the two. The deviation in the findings emphasizes the need to clarify which type of restoration produces better and efficient results. Therefore, the study has used systematic review analysis to analyze and compare the success rates of screw-retained and cement-retained fixed implant-supported reconstructions.

Materials and Methods

Search Strategy and Data Extraction

The studies' search and selection in this research was based on study protocols. Various keywords were used for searching the articles relevant to the study objective and scope. Such as

Tooth Screw Implantation OR Cement Retained Fixed Implant, AND Implantation Supported Reconstructions and more. The literature was searched using the words such as "Screw versus Cement Retained Fixed Implant Supported Reconstructions," "Screw Retained Fixed Implant" "Cement Implant" and "Dental Implant." The time range of 2010 to 2019 was set for selecting the studies. PubMed and Cochrane were used for conducting a comprehensive search, mainly concerning the controlled trial databases in the English language. Initial research yield 240 articles. The abstracts of the studies were reviewed for selecting studies that help yield accurate and valid findings concerning implantation in Saudi Arabia. Accordingly, the PICO (Participants, Intervention, Comparison, and Outcome) was used for narrowing the research scope, as presented in [Table 1](#).

Study Selection

Two hundred fifty studies were selected from PubMed, Google Scholar, and Cochrane database. The studies were assessed for duplication that, after reassessment, reduced to 120 studies. The remaining articles were examined concerning the inclusion and exclusion criteria, which further reduced to 30 studies. Further, only 12 articles with full texts were included, while others were excluded due to their non-eligibility with the inclusion criteria. [Table 2](#) presents the inclusion and exclusion criteria. The essays, blogs, and websites were excluded as the information provided in them is not always valid and is mostly individual-oriented. The graphical representation of the overall selection procedure is presented in [Figure 1](#). The data extracted from the

Table 1 PICO Question Analysis

Participants	Patients/clinically oriented studies
Intervention	Dental implant, Screw implantation and cement dental implantation
Comparison	Studies narrating Dental implant, Screw implantation and dental implantation in Saudi Arabia. Rehabilitation partially or completely edentulous patients treated with cement-retained or screw-retained prostheses.
Outcomes	Treatment outcomes, screw-retained outcomes and cement-retained.

Table 2 Inclusion and Exclusion Criteria

Criteria	Inclusion Criteria	Exclusion Criteria
Study Design	Randomized Controlled Trials (RCTs) Clinical Trials Prospective Studies Retrospective Cohort Studies	Blogs Case Report Case Series Studies
Time	2010 to 2019	Older than 2010
Language	English	Other than English
Intervention Type	Human Only	On animals
Follow-up Time	At least two years	Less than two years

studies include; authors, publication year, number of patients and implants, survival/success rates, and follow-up period.

Assessing Bias Risk

The selected articles' quality was evaluated based on the following items;

- Cases and controls comparability in terms of design and analysis
- Establishment of exposure
- Selection based on implantation cases including their presentation and definitions

The scale used constitutes 0 as the minimum score, and 9 as the highest score. The study was marked at a lower risk, where it scored six (representing good quality), while 3–5 scores were marked at modest risk of bias (fair quality).

Protocol and Registration

The study used protocol from the previous studies which are consistent with the reporting of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement 12.

Results

In the field of dentistry, dental implants are considered a successful treatment modality. This treatment may be associated with complications leading to implant failure based on the type of restoration that is being used; cement-retained restoration and screw-retained restoration. [Figure 2](#) presents the study design of the included 12 studies.

A study by Sailer et al⁸ revealed that unlike screw-retained restoration, the cement-retained restorations tend to exhibit serious biological complications. On the other hand, Wittneben et al¹² compared two methods of implant reconstructions, i.e., screw and cement, and showed an active role of cement-retained restoration as compared to screw.

Another systematic review of Brandao et al⁹ assessed the retention system of the two implant procedures. It compared the marginal bone loss that occurs using the difference in dental implantation treatment. The findings revealed that screw-retained prostheses were substantially assisted with greater bone loss, though, the difference between the two was not substantial. There was no significant difference observed between both types of restorations concerned with the difference in loss of marginal bone.

Shi et al¹³ conducted a retrospective cohort study with a follow-up time of four years. The study explored the peri-implant conditions as well as the bone loss for the two dental implantation techniques, such as cement and screw implantation. A total of 176 patients were divided into two groups, i.e., cement-retained group and screw-retained group. Using the Mann–Whitney *U*-test, the study has concluded that single crown cemented implantation of the tissue level shows similar results to that of the screw-retained crown. However, the limitation of the interocclusal space serves as a restriction to the cement-retained implantation.

Crespi et al¹⁴ performed a randomized control trial on eight years for analyzing the impact of the screw-retained implantation and cement-retained implantation. A total of 28 patients were divided into two groups based on the treatment received. The results of the study have concluded that both the restorations are extremely predictable,

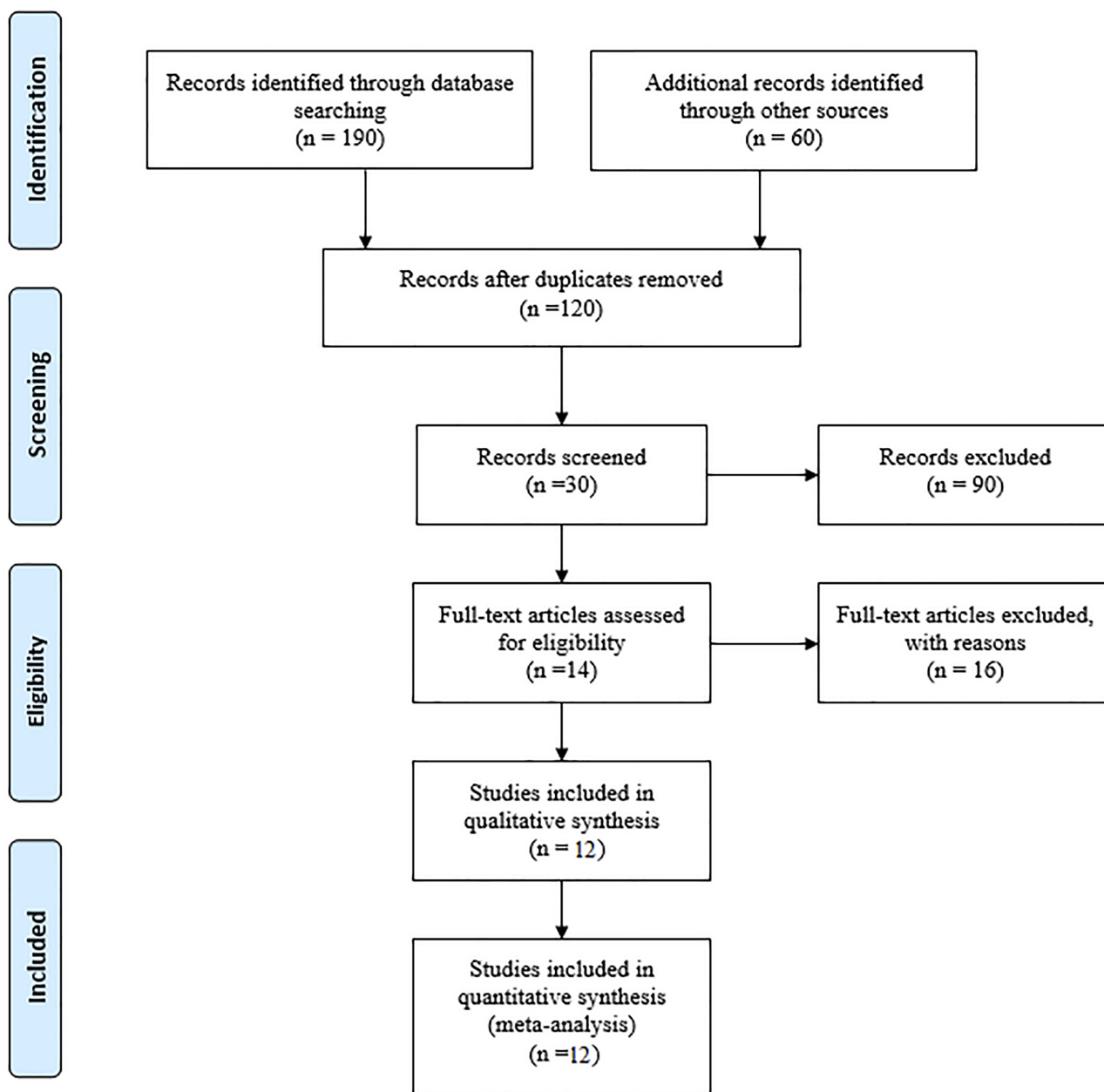


Figure 1 Selected studies.

esthetically pleasing, and biocompatible. The study has also observed no statistical difference between the two restorations concerning marginal bone loss.

Another systematic review of sixty-two papers by Ma and Fenton¹⁵ assessed the retention mechanism of the screw-retained dental implantation and cement-retained dental implantation. The review revealed that clinicians must consider the prosthodontics maintenance associated with the two treatment methods as well as analyzed the complications. The outcomes show that apart from these two methods, new implant components may also be considered for minimizing

the issues and complications of the two methods. It also emphasizes on the development of the standardized criteria for better reporting of outcomes of the two methods.

Millen, Brägger, and Wittneben¹⁶ compared the two types of dental implantation based on 72 studies. It used Poisson regression analysis, which showed that the technical complication was generally associated with the screw implant reconstruction, while biological complication was present in the cement-implant reconstruction. Overall findings conclude no substantial difference between the two implant reconstruction methods.

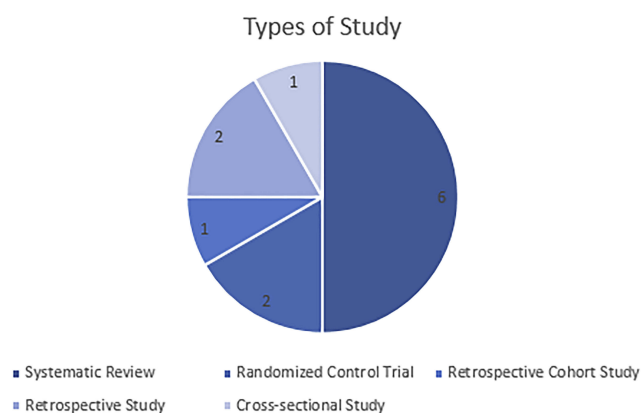


Figure 2 Selected studies design.

Hussien et al¹⁷ research examined the impact of ceramic implant-supported on the screw-retained crowns concerning their resistance to fracture. It included 60 CAD/CAM (computer-aided designed/computer-aided manufactured)

cement implanted screws, which was fabricated and retained using the maxillary premolar crowns. Thirty screws were occlusal screw-access channel while the remaining screws were without access channels. The outcomes revealed no momentous differences between the two groups. However, concerning the passivity, it showed improved outcomes for the cement-retained prosthesis.

Ragauskaitė et al¹⁸ systematic review for accessed the technical and biological complications of the two implantation techniques. It included ten studies between 2009 and 2015. The analysis showed that technical complication was generally associated with the screw-retained dental implant as compared to the cement-retained dental implant. It showed that the cement-retained dental implant was also skeptical of the technological complication, though the prevalence of biological complications such as pathological bone resorption and tissue inflammation was more complicated due to the excess of cement in the

Table 3 Comparison of Screw versus Cement Retained Fixed Implant Supported Reconstructions

Variable	Screw-Retained Fixed Implant	Cement-Retained Fixed Implant	Recommendation
Occlusion	✓	✓	Concerning stable and optimal occlusion, the screw-retained restoration can obtain the same results as that of cement-retained teeth. This highlights that occlusion is present on the crown and not on the channel filling material used in the screw. ^{12,17}
Esthetics	✓	✓	Esthetic success is not dependent on the use of a screw or cement-retained restoration. Both can be used to achieve the same esthetic result. ¹⁴
Porcelain Fracture	✓		Even though screw causes the decline of the strength, the appropriate adjustments to the occlusion scheme and appropriate adjustment can be made better as compared to the cement retained. ^{17,18}
Interocclusal Space and Retention	✓		Due to the limitation of the interocclusal space, the screw retained implant reconstruction is required. ¹³
Provisionalization And Gingival Molding	✓		Between the two, the screw-retained implant reconstruction has more advantages as compared to the cement retained. It is because it achieves better contours of the tissues, its health, and soft tissue transfer. ^{13,18,20}
Passivity		✓	Cement-retained implant reconstruction is fit for passivity based on its buffer of cement space. Since passivity pose a greater technical challenge in screw based on its discrepancies in dimension along with complication of the screws such as loosening or fatigue fracture. ^{10,17}
Biologic Complications		✓	The biological challenges are less in screw implant reconstruction as compared to the screw retained implantation. Moreover, the residue of the retention can cause microbial colonies as well as cause adverse effect on the tissues. ^{8,15,16,18}
Overall Complications, Retrieval, And Long-Term Treatment Planning	✓		Studies have revealed that prosthesis can be simplified using screw-retained implantation. ²⁰

peri-implant sulcus. It concluded that screw-retained crowns failed because of porcelain crack, which is resulted due to the loosening of the screws.

Wang, Judge, and Bailey¹⁹ assessed the implant treatment and its complications for the patients that were treated in the private practice. It used descriptive statistics along with generalized linear mixed modeling for the obtained data of the patients. The findings revealed that for the single implant crown, the complication such as loosening of the crown was less frequent. The study has shown that the attrition was related to the increased rate of veneering material fracture. However, it did not report on the type of prosthesis as well as complications, which were experienced by the patients.

Ferreiroa et al²⁰ retrospective study compared the cement as well as screw implanted restoration of the single tooth. Its follow-up period of 1 to 4 years. The findings demonstrated that though the cement-retained tooth was effective against the loosening of the screw, the excess of cement resulted in complications of the soft tissues. Accordingly, it showed that the presence of the peri-implantitis and mucositis was lower in the screw-retained implantation as compared to the cement-retained restorations.

Similarly, the cross-sectional study of Makke et al²¹ surveyed the frequency of the screw and cement-retained implantation. Using a survey-based questionnaire in the

Faculty of Dentistry at Umm Al-Qura University, it is found that most frequently, individuals seek cement-retained restoration as compared to the screw-retained restorations. However, it also showed that failure of the restoration was mostly associated with the cement-retained restorations. Table 3 presents the overall findings of the study and provides a recommendation.

Based on the review, a certain situation can be concluded where the preference of one is observed on the other (Table 4). This is particularly useful for the clinical, which facilitates their decision making in selecting the adequate treatment procedure.

Discussion

The systematic review reveals the significance and potential use of both screw and cement retention implant reconstruction. The studies reflected the significance of both the treatment options for replacing the missing teeth. The review established that the treatment selection must be based on the significance criteria and the adequacy of the treatment option to the subject condition of the tooth. The analysis has revealed that the dental implant using the screw is more suitable when predictability is desired. It also reveals the screw implantation allows easy oral hygiene maintenance, dental repairs as well as surgical intervention along with its efficacy when the interocclusal

Table 4 Situational Preference Between the Two Dental Implant Restorations

Cement Retention	Screw Retention	Studies
It can be adopted when a single unit is to be restored or when a short span restoration is required. It is assumed that screw torque and implant number can be optimized. In this case, screw retention is only adopted when the long axis of the implant is too parallel.	When full-arch implantation is required, the screw retained implantation reconstruction is preferred. It is because these are more complication as compared to short span ones'.	Makke et al ²⁰ Ferreiroa et al ²⁰
When the diameter crown is narrow, the use of screw can impact crown integrity.	The prostheses of the cantilevered are required to be screw implanted reconstruction as these structures required to undergone maintenance during the prosthesis's lifetime.	Wang, Judge, and Bailey ¹⁹ Crespi et al ¹⁴
When the prospects for the occlusion surface prevails concerning the esthetics or the occlusal stability because of restorative material sealing, the cement retained implant reconstruction is preferred.	It is also preferred in a situation when the patient has high prospects of developing gingival recession. Since the implantation is less complicated, it can easily be removed or modified in case new conditions occur.	Ragauskaitė et al ¹⁸ Ma and Fenton ¹³
Cement restoration can be adopted for misaligned implant restoration.	The screw retained implant reconstruction is more preferred when the patient is expected to experience more tooth loss in the future.	Shadid and Sadaqa ²
	This can be used for the removal of the excess cement, or when there is a strong prevalence of the technical or biological complications.	Shadid and Sadaqa ²

space is limited. These advances in oral hygiene improve the patient's perception of implant treatment.²² It also reveals that the restoration through screw requires great precision due to the prosthetic placement of the screw into the hole. However, studies showed that screw implantation is more technically sensitive and demanding in contrast to the cement-retained implant reconstruction.^{16,17}

Contrary to it, the cement-retained dental implant reconstruction is cheaper than screw implantation and can compensate for the discrepancies concerning the dental implant position. The examination of the studies has also revealed its efficacy in terms of passivity, enhanced esthetics, and better occlusion control as compared to the other implant technique. Though, it has one major drawback of leaving a residue of cement or excess cement, which leads to anaerobic development, causing biofilm growth, infection, and continuous bone loss. Similar findings have been drawn by various studies, which outline the advantages and disadvantages of the two information systems.^{23–26}

The review of the two-implant reconstruction method shows that each dental implant treatment has its own advantages and disadvantages. The present systematic review demonstrated that the different sets of benefits and drawbacks highlight that a single treatment procedure cannot be adopted for treating each clinical significance. Therefore, the choice of retention treatment procedures depends upon the clinician who devises evidence-based decisions for selecting an effective treatment method. The certain risk that was highlighted in the study includes loosening of the screw, chipping or fracturing as well as pre-implant tissues. The present study outcomes establish that decision-maker should significantly consider the retrievability for the management of technical and biological complications.

The study findings are limited due to its time and study design. Also, no RCTs have been reviewed in the study concerning the comparison of cement and screw-retained implantation. Also, the conclusions drawn are based on less or more heterogeneous retrospective and prospective studies. This can lead to misinterpretation risk as other variables other than fixation such as implant surface, implant system, and study conditions are considered more integral for results, which may lead to a difference in the compared groups. Therefore, these must be carefully interpreted.

Conclusion

This systematic review presents a comprehensive understanding of the two types of dental implant reconstructions. It shows that the retention of the tooth is more stable and functional

when the method of implantation is selected based on the efficiency of a treatment procedure as per the subjected case. It is because both techniques provide certain advantages and disadvantages. The review concludes that the cement-retained implant procedure can be adopted in case of increased predictability, the demand of the patient for high esthetic outcomes, and a cost-effective method. Since the screw implant presents substantial complication in terms of technical and prosthetic outcomes; therefore, cement implant reconstruction presents more effective outcomes. Whereas, a biological complication associated with the cemented implant promotes the use of screw-based implant reconstruction. Moreover, the screw-retained reconstruction is more adequate for implantation of multiple units and patients who have limited interarch space. The study also presents a recommendation for the two types of dental implantation. For instance, the screw retention reconstruction is recommended when there is limited interarch space (ie, minimum 4 mm), and when retrievability is required. Likewise, cement retention of implant reconstruction can be adopted for compensating the incorrectly inclined implants and when occlusion is easier to control without the hole.

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Disclosure

The authors report no conflicts of interest in this work.

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