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Original article

Practice of ultrasound-guided arthrocentesis and joint injection, including training and implementation, in Europe: results of a survey of experts and scientific societies

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Abstract

Objectives. To document the practice and training opportunities of US-guided arthrocentesis and joint injection (UGAJ) among rheumatologists in the member countries of the European League Against Rheumatism (EULAR).

Methods. An English-language questionnaire, containing questions on demographics, clinical and practical aspects of UGAJ, training options in UGAJ for rheumatologists, UGAJ education in the rheumatology training curriculum and other structured education programmes in UGAJ was sent to three different groups: (i) all national rheumatology societies of EULAR; (ii) all national societies of the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB); and (iii) 22 senior rheumatologists involved in EULAR musculoskeletal US training from 14 European countries, who were also asked to circulate the questionnaire among relevant colleagues.

Results. Thirty-three (75%) of 44 countries responded to the questionnaire (61.3% of national rheumatology societies, 25% of the national US societies and 100% of expert ultrasonographers). In the majority of countries (85%) <10% of rheumatologists routinely perform UGAJ in clinical practice, while the remaining countries (15%) reported a rate of 10–50%. The percentage of rheumatologists receiving training in UGAJ was <10% in the majority (72.7%) of countries.

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CLINICAL SCIENCE

Conclusion. The study highlights the relatively low prevalence of UGAJ as compared with the high (>80%) rate of rheumatologists performing conventional joint injection in most of the surveyed countries. The reported variations in practice and the lack of available structured training programmes for trainees in most countries indicates the need for standardization in areas including training guidelines.

Key words: musculoskeletal ultrasound, ultrasound-guided arthrocentesis, ultrasound-guided joint injection, education, training, Europe

Introduction

In addition to its primary use as a diagnostic tool, musculoskeletal ultrasonography (MSUS) is increasingly valued by rheumatologists for its use in guiding musculoskeletal interventions, which offer the chance to improve efficacy by enabling visualization of the target area. Among musculoskeletal interventions, arthrocentesis and joint injection as well as soft-tissue injections using various compounds are the procedures perhaps most characteristic to the profession of clinical rheumatology. Among various imaging-guided interventions, US guidance has emerged as one the most widely utilized modalities. US can be used to detect synovial effusion, the target of arthrocentesis, or to detect other musculoskeletal pathology (enthesitis, tenosynovitis, etc.) not necessarily associated with the presence of synovial effusion for which an injection may be indicated. Generally, all US-guided interventions are performed by using one of the two methods: indirect and direct visualization. Indirect visualization involves the performance of a pre-intervention US examination. The information gained during this examination is then used in the planning of the intervention (type of needle, route, angle, etc.), which is then performed similarly to conventional, i.e. non-imaging guided, arthrocentesis or joint injection (CAJ). The direct visualization method involves the performance of an US examination simultaneously with the intervention, which allows real-time visualization of the target lesion along with the inserted instrument, i.e. the intervention itself. Direct visualization involves the physical presence of the US transducer in the area of the intervention. Real-time scanning diminishes the rate of complications [1], which are infrequent when the operator maintains strict sterility. The first report of US guidance in aspiration was reported by Kratochwill [2] to sample amniotic fluid, while Gombels and Darlington [3] and Komppa *et al.* [4] reported the first US-guided aspiration of SF from the shoulder and hip, respectively. A detailed description of US-guided interventional musculoskeletal procedures may be found in reviews and textbooks [5, 6]. A number of studies have addressed the success rate of US-guided *vs* conventional arthrocentesis as well as the accuracy of US-guided *vs* conventional joint injection, while only a relatively small number of studies have addressed outcome [7–14]. Very little is known, however, regarding practice and training in US-guided arthrocentesis and joint injection (UGAJ). Due to the scarcity of information, the aim of this survey was to document the practice of UGAJ and training opportunities among rheumatologists in the member countries of the European League Against Rheumatism (EULAR).

Methods

Study design

An English-language questionnaire was designed by a group of senior ultrasonographer rheumatologists. The questionnaire was sent by e-mail or regular mail to three different groups in late 2009 to early 2010:

(i) all 44 national rheumatology societies of EULAR (incorporating 41 European countries, Armenia, Israel and Lebanon);
(ii) all 29 national societies of the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) (28 European countries and Israel; all included among the 44 EULAR countries); and
(iii) 22 rheumatologists expert in UGAJ from 14 European countries who have been involved in both national and international training programmes in MSUS. These ultrasonographer rheumatologists were from the following countries: Denmark, Finland, France, Germany, Hungary, Ireland, Italy, The Netherlands, Norway, Poland, Serbia, Spain, Switzerland and the UK. The questionnaire was accompanied by an explanation regarding the purpose of the survey. Non-responding persons and organizations were sent a reminder after 8 and 12 weeks.

Questionnaire design

The questions contained in the questionnaire were divided into three sections: demographics, practice of UGAJ and training, and education in UGAJ for rheumatologists. Questions on demographics requested information concerning the country of the responder. Questions on clinical use and on training and education in UGAJ for rheumatologists requested information concerning the country of the responder as well as the responder as an individual. Overall the survey contained 32 questions, including 3 subquestions, many of which had multiple response options.

Analysis

Simple descriptive and summary statistics were calculated from the responses. When contradictory answers were received regarding information concerning countries

between the questionnaires of UGAJ experts and the national rheumatology societies, respondents were asked to review the differences and to provide a consensual response.

Results

Survey

A total of 33 of 44 (75%) countries (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Latvia, Lebanon, Lithuania, Malta, Montenegro, The Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and UK) responded to our survey. The response rate was 27 out of 44 (61.3%) with respect to national rheumatology societies; 7 out of 28 (25%) with respect to national societies of the EFSUMB; and 22 out of 22 (100%) for rheumatologists expert in UGAJ. Surveys from 48 individuals were collected: among the responders, 22 were rheumatologists expert in UGAJ, 27 were individuals delegated by respective national rheumatology societies and 7 were individuals delegated by respective national societies of the EFSUMB. Four responders were delegated by both their individual societies and four additional responders were rheumatologist experts who were also delegates of one of their national societies. Forty-five out of 48 responders were certified rheumatologists, 2 were trained in internal medicine and 1 was a physical medicine and rehabilitation specialist. There were minor contradictory responses concerning questions between expert rheumatologists and the national rheumatology societies from five countries, which were resolved by feedback, and a consensual response was reached in all cases.

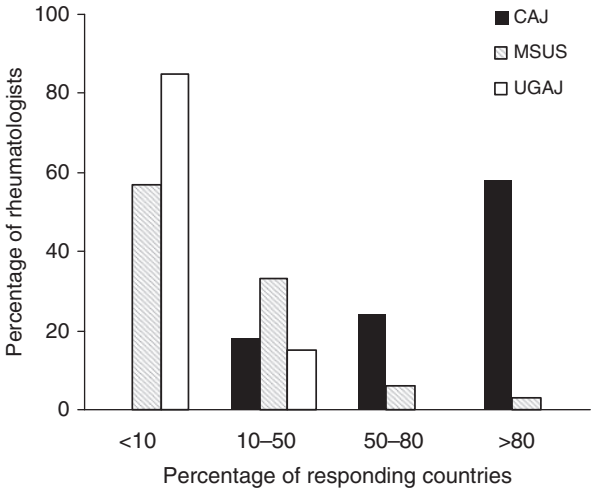
Demographics

The reported number of rheumatologists in European countries of EULAR ranged from 11 (Cyprus) to 2300 (France). The number of rheumatologists was >500 in 6 out of 33 (18.2%) countries (France, Germany, Hungary, Italy, Poland and Spain). Fifteen out of 33 (45.4%) countries (Austria, Belgium, Czech Republic, Denmark, Greece, Israel, The Netherlands, Norway, Portugal, Romania, Serbia, Sweden, Switzerland, Turkey and UK) had 100–500 rheumatologists. Twelve of 33 (36.4%) countries (Bulgaria, Croatia, Cyprus, Estonia, Finland, Ireland, Latvia, Lebanon, Lithuania, Malta, Montenegro and Slovakia) reported <100 rheumatologists.

Practice of UGAJ among countries

The percentage of rheumatologists performing CAJ was >80% in 19 of 33 (57.6%) countries, with an additional 8 (24.2%) and 6 (18.2%) countries reporting percentages of 50–80% and <50%, respectively. No country reported <50% for the percentage of rheumatologists performing CAJ (Fig. 1).

Fig. 1 Percentage of rheumatologists routinely performing conventional joint injection and arthrocentesis (CAJ), musculoskeletal ultrasound (MSUS) or ultrasound-guided arthrocentesis and joint injection (UGAJ) by percentage of responding countries ($n = 33$).



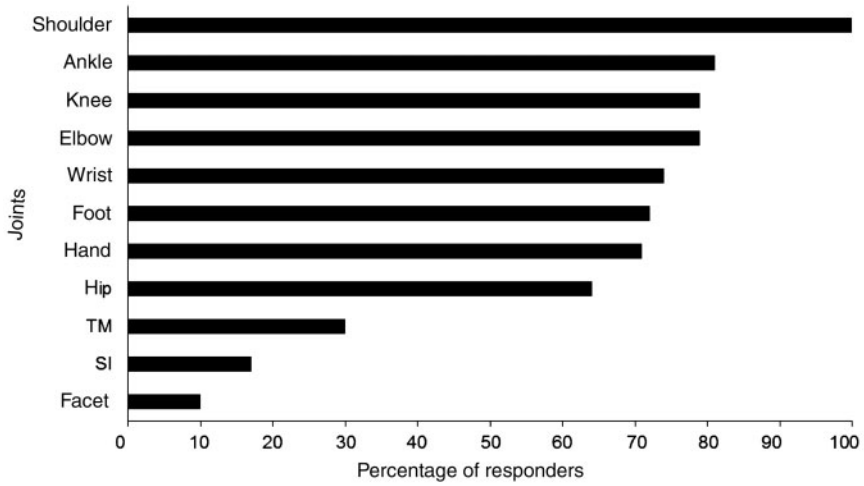
Regarding the percentage of rheumatologists performing MSUS, 19 out of 33 (57.7%) countries reported <10%, while 11 (33.3%) reported 10–50%. Two out of 33 countries (6%) (Spain and Norway) reported 50–80% and 1 out of 33 countries (3%) (Germany) reported >80% for the percentage of rheumatologists performing MSUS (Fig. 1).

Concerning the percentage of rheumatologists performing UGAJ, 28 out of 33 (84.9%) countries reported <10%, with the remaining 5 out of 33 (15.1%) countries (Finland, The Netherlands, Norway, Serbia and Spain) reporting 10–50%. In no country was the percentage of rheumatologists performing UGAJ >50% (Fig. 1).

Rheumatology was listed among medical specialities that perform UGAJ in 29 out of 33 (87.9%) countries. Radiologists, sports medicine specialists and orthopaedic surgeons were reported as specialists performing UGAJ by 18, 17 and 14 out of 33 countries, respectively (54, 51 and 42%, respectively). Physical medicine specialists, emergency medicine specialists, internists, paediatric surgeons and general practitioners were also listed as specialists performing UGAJ by a smaller number of countries. Latvia, Montenegro, Slovakia and Sweden were countries where rheumatologists were not reported as a specialty that routinely performs UGAJ.

Rheumatologists receive reimbursement for UGAJ in 18 out of 33 (54.5%) countries (Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Italy, Lithuania, Norway, Portugal, Serbia, Romania, Slovakia, Slovenia, Spain, Switzerland and the UK). Reimbursement is received in private practice in most [14 out of 33 (42.5%)] countries, in public practice in 2 out of 33 (6%) (Estonia and Norway), and in both private and public practice in an additional 2 out of 33 (6%) countries (Germany and Switzerland).

FIG. 2 Commonly targeted joints for UGAJ by percentage of responders. Each represented joint also includes UGAJ performed on related bursae, ligaments and tendons. TM, temporomandibular joint; SI, sacroiliac joint; facet, zygapophysial joint.



Practice of UGAJ among individual responders

In addition to data on the practice of UGAJ regarding the various countries, the survey also collected data concerning the individual practice of UGAJ among the responders. Forty-three out of 48 (89.5%) responders have reported performing UGAJ regularly. Out of these 43 responders, 29 (67.4%) have performed >300, 9 (20.9%) have performed between 50 and 300, and 5 (11.7%) have performed <50 UGAJ interventions.

The shoulder joint was the joint most commonly targeted for UGAJ, indicated by 43 out of 43 (100%) responders who reported performing UGAJ regularly. The results pertaining to the other joints are shown in Fig. 2. Thirty-four out of 43 (79%) responders also perform US-guided entheseal injections, 8 out of 43 (18.6%) perform US-guided nerve blocks, 6 out of 43 (13.9%) perform additional soft-tissue injections (bursa, tendon sheath) and 5 of 43 (11.6%) perform US-guided barbotage (repeated injection and aspiration of fluid used commonly for removing calcification from tendons, i.e. calcifying tendinitis).

Regarding the compound injected during UGAJ, 42 out of 43 (97.6%) reported using corticosteroids, 26 out of 43 (60.4%) reported using anaesthetics and 18 out of 43 (41.8%) reported using hyaluronan. Radionuclides and osmic acid were used by 3 out of 43 (6.9%) and 2 out of 43 (4.6%) responders, respectively, while saline was used by 2 out of 43 (4.6%) responders.

UGAJ interventions are generally performed by using one of the two methods: indirect and direct US guidance.

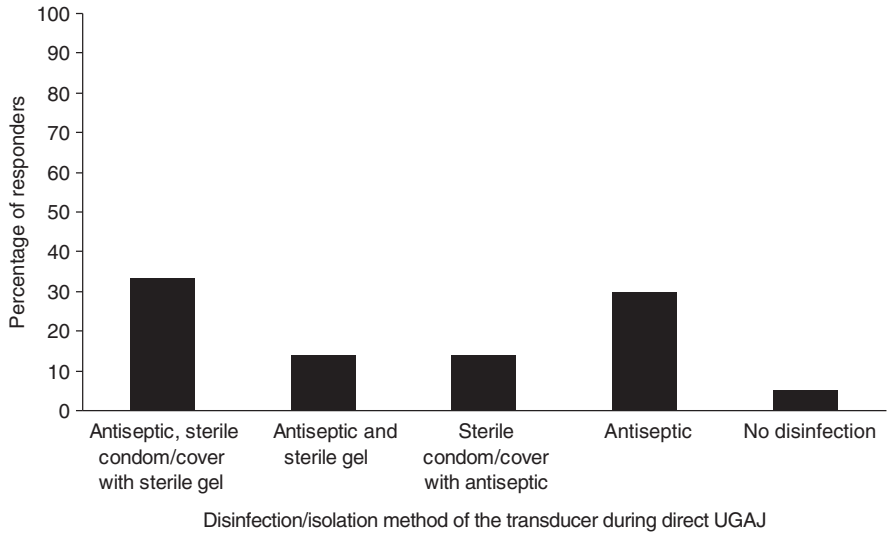
Twenty-six of the 43 (60.4%) responders who perform UGAJ regularly report using both indirect and direct US guidance for their arthrocentesis and joint injection. Ten of 43 (23.3%) perform these interventions only under direct guidance, while 7 out of 43 (16.3%) utilize only indirect US guidance.

Of the 36 responders performing interventions under direct guidance (either exclusively or in addition to indirect guidance), 32 (89%) perform the entire procedure (US scan and injection) by themselves without assistance. Two of 36 (5.5 %) are assisted by rheumatologist colleagues and 2 out of 36 (5.5%) are assisted by sonographers who perform the scanning while they perform the injection.

The direct visualization method involves the physical presence of the US transducer in the area of the intervention during the intervention, requiring disinfection and isolation of the transducer. Regarding commonly used items during the direct procedure, out of the 36 responders performing direct UGAJ (either exclusively or in addition to indirect guidance), 32 (89%) use an antiseptic during the procedure. Eighteen out of 36 (50%) use either a sterile condom or a sterile cover to isolate the transducer and 16 of 36 (44.4%) use sterile gel. Thirteen of the 36 (36.1%) responders use neither sterile gels nor sterile condoms or covers to isolate the transducer, relying on antiseptic or, in one case, sterile gloves only. Seventeen of 36 (47.2%) use sterile gloves, 10 out of 36 (27.7%) use sterile masks, 7 out of 36 (19.4%) use either sterile aprons or gowns, 5 out of 36 (13.9%) use sterile drapes, 2 out of 36 (5.5%) use sterile sponges, 2 out of 36 (5.5%) use sterile caps and 1 out of 36 (2.7%) uses sterile glasses during direct UGAJ.

In order to get a better understanding of the technical and hygienic protocol followed during direct UGAJ, we requested information on the actual technique of asepsis used. Twelve out of 36 (33.3%) responders use the most sophisticated available method, involving the use of an antiseptic followed by the application of a sterile condom/cover over the transducer and sterile gel between the isolated transducer and the skin surface. Eleven out of 36 (30.5%) reported using antiseptic alone, 5 out of 36 (13.9%) use a combination of sterile gel and

FIG. 3 Disinfection/isolation of the transducer during direct UGAJ by percentage of responders.



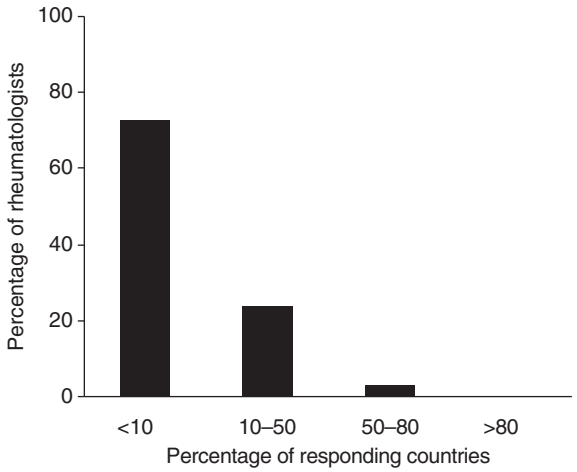
antiseptic without using a cover/condom and an additional 5 of 36 (13.9%) use a combination of a sterile condom/cover and antiseptic without using sterile gel. Three out of 36 (8.3%) responders performing direct UGAJ reported not isolating or disinfecting their transducer during the procedure (Fig. 3). Concerning the type of US transducer (linear or curved) used during UGAJ (both indirect and direct guided), 26 out of 36 (72.2%) reported using linear transducers, while 10 out of 26 (27.8%) reported using both curved and linear transducers.

Training in UGAJ for rheumatologists among countries

The percentage of rheumatologists receiving training in UGAJ was <10% in 24 out of 33 (72.7%) countries. In 8 out of 33 (24.3%) countries (Bulgaria, France, Israel, The Netherlands, Norway, Serbia, Slovenia and Sweden), between 10 and 50% of rheumatologists have received training in UGAJ, and in 1 out of 33 (3%; Spain) countries, between 50 and 80% of rheumatologists are reported to receive training in UGAJ (Fig. 4). In the overwhelming majority of countries [29 out of 33 (87.8%)], rheumatologists have been trained in UGAJ through courses, while informal training from rheumatologists or other specialists was listed as a means of training by 21 out of 30 (63.6%) countries.

Training in UGAJ is not included in the rheumatology curriculum in 22 out of 33 (66.7%) countries. Eight out of 33 (24.2%) countries reported that training in UGAJ is an optional element in their rheumatology curriculum. Training in UGAJ is obligatory for rheumatology trainees in only 3 out of 33 (9.1%) countries (Israel, Norway and Slovenia). However, even where UGAJ is an optional or obligatory part of the rheumatology curriculum, competency was only assessed in 5 out of 11 (45.5%) countries (Latvia, Lithuania, The Netherlands, Norway and Slovenia)

FIG. 4 Percentage of rheumatologists receiving training in UGAJ by percentage of responding countries ($n = 33$).



by theoretical/practical examination, with Slovenia additionally requiring the performance of 50 supervised UGAJ procedures.

Structured training programmes in UGAJ are offered in 11 out of 33 (33.3%) countries (Bulgaria, France, Germany, Ireland, Israel, The Netherlands, Poland, Romania, Serbia, Spain and Switzerland); in 8 of these 11 (72.7%) countries (Bulgaria, Germany, Ireland, Israel, The Netherlands, Poland, Serbia and Spain) the courses are offered by the national rheumatology society. Summarizing the responses to the above two questions, 18 out of 33 (54.5%) responding countries have no available training programmes in UGAJ, neither as structured

training programmes nor as part of the rheumatology curriculum.

Training in UGAJ among individual responders

Thirty out of 43 responders who regularly perform UGAJ (69.8%) have been trained in UGAJ, while 13 (30.2%) have not received training. Of the 30 responders trained in UGAJ, 25 (83.3%) have participated in UGAJ courses; 9 out of 30 (30%) and 3 out of 30 (10%) also received training from a rheumatologist or a radiologist experienced in UGAJ, respectively. Three out of 30 (10%) were trained only by a radiologist and 1 responder (2.7%) was trained by a physical medicine and rehabilitation specialist.

Discussion

Our present survey is the first to specifically focus on US-guided musculoskeletal interventions in European countries. The first report on the practice of UGAJ among rheumatologists comes from a general survey on the practice of US among rheumatologists attending the 1999 EULAR Annual Congress. In this survey, 30% of the 92 responders found US useful for guided aspirations/injections, and 12% of the US examinations were performed for UGAJ [15], especially for injecting deep joints (hip and shoulder), but interestingly, also for the knee. A later survey conducted in the UK on MSUS practice and training confirmed these findings, as indicated both by rheumatologists performing MSUS and rheumatologists referring for MSUS examination [16]. Recently, an extensive questionnaire investigated the current state of MSUS training and the extent of implementation among rheumatologists in member countries of EULAR and demonstrated a huge growth in uptake when compared with previous surveys, especially in the number of countries that actually perform MSUS [17]. While earlier surveys aimed to cover several areas of MSUS, our survey focused entirely on the use of MSUS for guiding injection, permitting a complete overview of this indication across Europe (33 out of 44 EULAR countries). By including questions concerning both national societies and individual responders, this survey allowed us to achieve a dual goal in collecting information on both practice and training in UGAJ. Despite our intentions to be as comprehensive as possible, and despite a very good overall response, we did not receive all the intended information.

Certain limitations, however, could not be avoided, mostly affecting information pertaining to countries: despite good overall response, a number of countries have not provided information, and in many countries we received information from only a single representative, which introduces bias to the results. Additionally, the high degree of interest among responders could have led to overestimated or skewed UGAJ practice characteristics within the countries.

The remarkable growth in the number of rheumatologists performing MSUS in the last decade is well documented by a recent survey [17]. Lacking comparable data, we can only presume that the same phenomenon has likely led to a concomitant increase in the number of rheumatologists performing UGAJ, although the percentage of rheumatologists performing UGAJ in European counties is lower than the percentage of rheumatologists performing MSUS overall, which means that presumably most of them continue to perform CAJ.

Similarly, the percentage of rheumatologists receiving training in UGAJ is also quite low, and the higher prevalence of training within the individual responders is likely due to the high degree of interest and selection bias of the responders. Currently training in UGAJ is included in the rheumatology curriculum in only a small number of countries, and overall structured training programmes are lacking in more than half of the responding countries. Lack of training and an almost total lack of competency assessment in countries where training is available may explain the far-ranging differences in the practical aspects of UGAJ as revealed by the survey.

We could not find any clear guidelines concerning the general performance of UGAJ or the mode of sterilization/disinfection used in direct visualization UGAJ. In accordance with the lack of guidelines, our survey has revealed wide variation with regard to the disinfection and isolation of the US transducer during direct UGAJ.

In conclusion, despite widespread use and interest in performing UGAJ, several steps should be performed for unifying the practice of UGAJ in Europe. A general scarcity of training programmes and an almost complete lack of competency assessment is the main observation at country level, as well as large individual variation among rheumatologists expert in UGAJ regarding both indication and technique. The results of our survey highlight the need for standardization with respect to both practical and training guidelines.

Rheumatology key message

- Standardized practical and training guidelines are needed for US-guided arthrocentesis and joint injection.

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