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Incidence and management of mallet finger in Dutch primary care.

Patrick Krastman[1], Evelien IT de Schepper[1], Patrick JE Bindels[1], Sita MA Bierma-Zeinstra[1,2], Gerald Kraan[3] and Jos Runhaar[1]

(1) Erasmus MC University Medical Center Rotterdam, Department of General Practice. PO Box 2040, 3000 CA Rotterdam, the Netherlands.

(2) Erasmus MC University Medical Center Rotterdam, Department of Orthopedics & Sports Medicine. PO Box 2040, 3000 CA Rotterdam, the Netherlands.

(3) Reinier de Graaf Groep, Department of Orthopedic Surgery. Reinier de Graafweg 5-11, 2625 AD Delft, the Netherlands.

Patrick Krastman MD (corresponding author): wetenschap@dezorghoek.nl

Gerald Kraan PhD MD: g.kraan@rhoc.nl

Patrick J.E. Bindels PhD MD: p.bindels@erasmusmc.nl

Evelien I.T. de Schepper PhD MD: e.deschepper@erasmusmc.nl

Sita M.A. Bierma-Zeinstra PhD: s.bierma-zeinstra@erasmusmc.nl

Jos Runhaar PhD: j.runhaar@erasmusmc.nl

P. Krastman (corresponding author)

ORCID iD: 0000-0002-5609-9471

Erasmus MC University Medical Center Rotterdam

Department of General Practice, Room NA1911

PO Box 2040

3000 CA Rotterdam, the Netherlands

T: +31(0)10-7044192, F: +31(0)10-7044766

wetenschap@dezorghoek.nl

Abstract

Background

A mallet finger (MF) is diagnosed clinically and can be managed in primary care. The actual incidence and management of MFs in primary care is unknown.

Aims

To determine the incidence of MFs in primary care and to obtain estimates for the proportions of osseous and tendon MFs. Additionally, to gain insight in the management of patient diagnosed with a MF in primary care.

Design and setting

A cohort study using a healthcare registration database from general practice.

Method

Patients aged ≥18 years with a new diagnosis of a MF from 1 January 2015 to 31 December 2019 were selected using a search algorithm based on International Classification of Primary Health Care coding.

Results

In total, 161 MF cases were identified. The mean incidence was 0.58 per 1000 persons–years. In 58% (n=93) of the cases, a radiograph was taken; 23% (n=37) of MF cases had an osseous MF. The most applied strategies were referral to secondary care (45%) or conservative treatment in GP practice (43%). 11% was referred to a paramedical professional.

Conclusion

On average, a GP assesses ±1 patient with a MF per year. Since only a minimal number of patients required surgical treatment and a limited number of GPs requested radiography, the recommendation in the guidelines to perform radiography in all patients with MF should potentially be reconsidered. The purpose of requesting radiographs should not be to distinguish between a tendinogenic or osseous MF, but to assess whether there is a possible indication for surgery.

Keywords

Incidence; management; mallet finger; general practice; primary health care.

How these fits in

Mallet finger (MF) is a traumatic finger injury of which the diagnosis is mainly made on clinical signs and symptoms. This study, to the authors' knowledge, is the first study that provides an insight in the incidence of MFs in primary care, as well as the applied management strategies by general practitioners (GPs). On average, a Dutch GP assesses ±1 patient with a MF per year. The study found a discrepancy between guideline-recommended treatment strategies and the applied management by GPs. There was less use of imaging and greater referral to secondary care, compared to guideline recommendations. Since only a minimal number of patients required surgical treatment and radiography requests were limited, the recommendation in the guidelines to perform radiography in all patients with MF should potentially be reconsidered.

INTRODUCTION

A mallet finger (MF) results following forceful flexion of an extended distal phalanx, causing extensor tendon disruption, either isolated or in combination with a distal phalanx avulsion fracture.[1-4] The diagnosis of MF is mainly made on clinical signs and symptoms. Based on current literature and guidelines, radiography should always be performed to differentiate between an osseous mallet injury or a tendinous one and assessment of volar subluxation of the distal phalanx. [5, 6] A tendinous MF is more common than an osseous MF.[7]

Despite the feasibility of MF diagnosis and treatment in primary care, the incidence figures and management of MFs in primary care is still unknown.[6]

In primary and secondary care, the treatment of a tendinogenic MF or a osseous MF is mainly conservative with continual splinting or casting of the DIP joint in extension for 6-8 weeks, followed by a program to gradually increase range of motion .[1,6,8] The treatment of most MFs can be performed by general practitioners (GPs) and hand therapists in primary care.[6, 9] Consensus is lacking on the indications for the surgical treatment of an osseous mallet finger.[10]

Currently, there is a clear absence in knowledge on the incidence and management of MFs in primary care. The objectives of the study were: 1) To determine the incidence of MFs in primary care, 2) to obtain estimates for the proportions of osseous and tendon MFs, and 3) to gain insight in the management strategies of patient diagnosed with a MF in primary care.

METHOD

Study design

A cohort study using the Rijnmond Primary Care database (RPCD) was conducted. The RPCD is a region-specific product of the Integrated Primary Care Information (IPCI) database, supervised by the department of General Practice of the Erasmus MC University Medical Center Rotterdam, the Netherlands. More information about the IPCI database has been prescribed in detail elsewhere.[11] In short, the RPCD is a longitudinal observational dynamic database containing medical records of over 200,000 primary care patients in the larger Rotterdam area.[12] All citizens in the Netherlands are obliged to register with a GP practice. A Dutch GP forms the first point of care for all health-related problems and acts as a gatekeeper.[13, 14] These pseudonymized medical records contain demographics, medical notes (free text), diagnoses (including International Classification of Primary Care [ICPC] codes), referrals, imaging results and specialists' letters that are routinely collected by GPs. The database included approximately 25% of the population of the area of Rotterdam, equally distributed across the region and including neighbourhoods with different socioeconomic and migration levels.

Study cohort

The study population consisted of adults aged ≥ 18 years with a new episode of a MF between 1 January 2015 and 31 December 2019. The diagnosis was considered new if the patient had not been diagnosed with a MF in the preceding 12 months. Patients could be included in the study population more than once if there was >12 months between the initial diagnosis and subsequent consultations for a MF. Diagnoses of an MF made at the out-of-hours GP service, are processed in the GP information system, and are therefore also included in the database of the RGPD. Diagnoses of a MF were identified using International Classification for Primary Care (ICPC) coding and with supporting keywords in the free text.[15] Patients were considered a 'potential MF case' if they received the ICPC code L98.01 (Mallet-finger) or if they received the ICPC code L12 (hand/finger symptoms/ complaint), L74.01 (fracture phalanges hand), or L81 (other musculoskeletal injuries), in combination with the

(Dutch) words ‘mallet’, ‘phala’, ‘fala’, ‘digit’, ‘pees (tendon)’, ‘extensor’, or ‘gewricht (joint)’ in the free text. This algorithm excluded cases in which these words were combined with terms of negation (e.g., not, or no).

Data extraction

To obtain the positive predictive value (PVV) after running the search algorithm, 200 random medical files from potential cases throughout the study period were manually reviewed (PK). These files were examined from the consultation date of the initial diagnosis up to 6 months after the first consultation. Potential cases were a true MF case if the GP defined the consultation as a MF injury. Unclear cases were also assessed by a hand surgeon (GK), and final decisions were based on consensus. For each true case in the 200 random samples, information on year of birth, sex, the affected finger, trauma mechanism, whether a radiograph was taken, osseous or tendon MF, and the number of consultations with the GP for one episode of complaints were extracted (PK). The management strategies were registered for all MF patients who were initially diagnosed and treated by their GP: policy by GP (conservative treatment in GP practice), referral to a secondary care specialist (trauma surgeon, orthopaedic surgeon, or plastic surgeon), referral to a paramedical professional (hand therapist, physiotherapist, ergo therapist), and treatment (conservative or surgically) by secondary care specialist. Telephone consultations were counted as consultations, provided that the GP registered a contact with the patient and discussed the diagnosis or management of MF.

Statistics

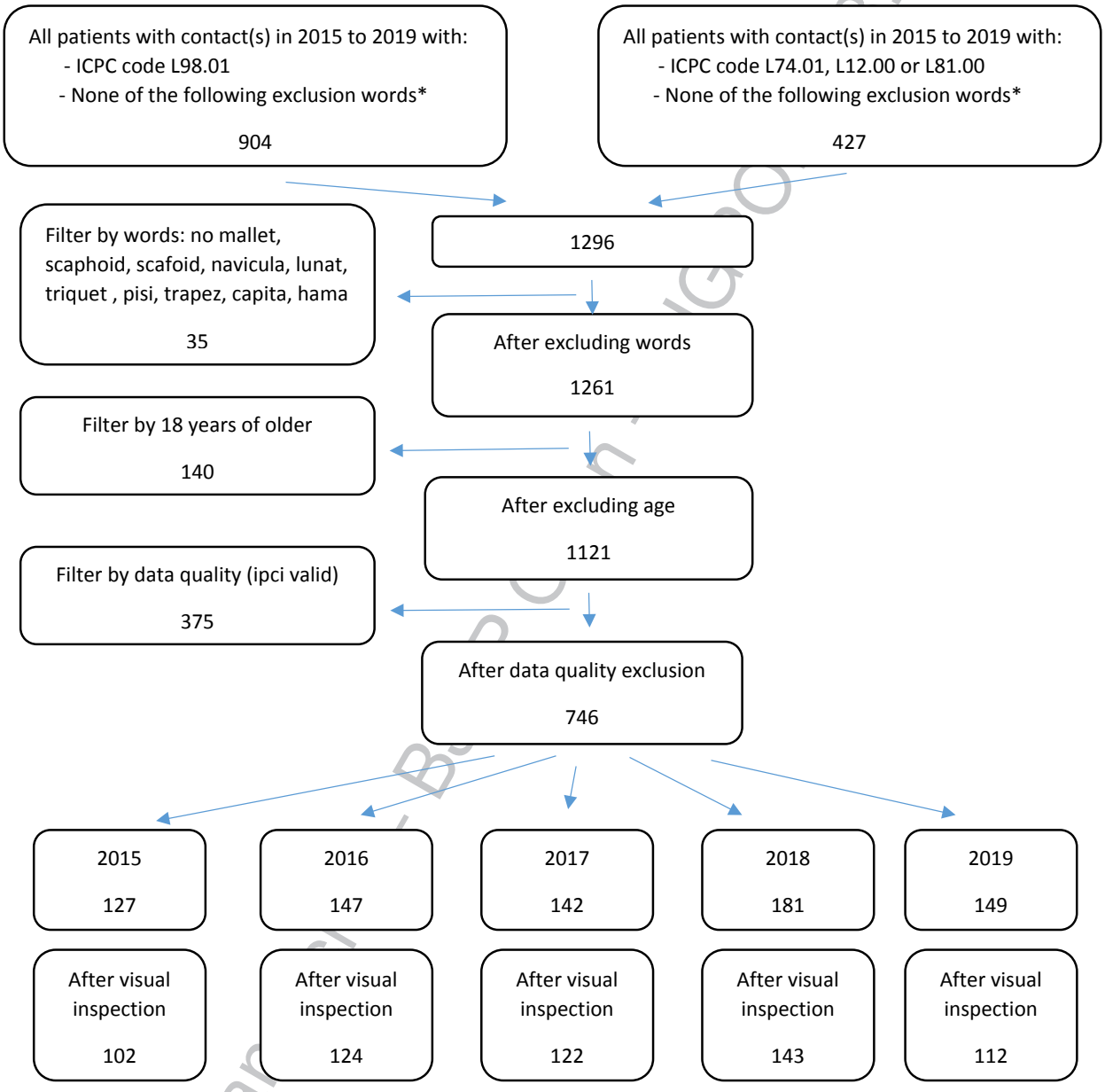
Incidence numbers per study year, as obtained by the search algorithm, were multiplied with the estimated annual PVV to obtain yearly incidence estimates. The 95% confidence intervals (Cis) were calculated from the incidence, using Poisson distribution. The annual incidence of mallet fingers per 1000 persons-years was also subdivided for males and females, and for age categories 18-40 years, 41-60 years, and ≥61 years. Descriptive data for the identified cases (age, affected finger, number of

consultations, trauma mechanisms, number of radiographs, referral) were described as numbers (percentages), medians (IQR), and means (SD). All analyses were performed using IBM SPSS Statistics (IBM SPSS for Windows version 27.0 (SPSS Inc., Chicago, IL, USA). R Studio was used for Poisson distributions.

RESULTS

Study population

The flow diagram for the study population is presented in Figure 1.

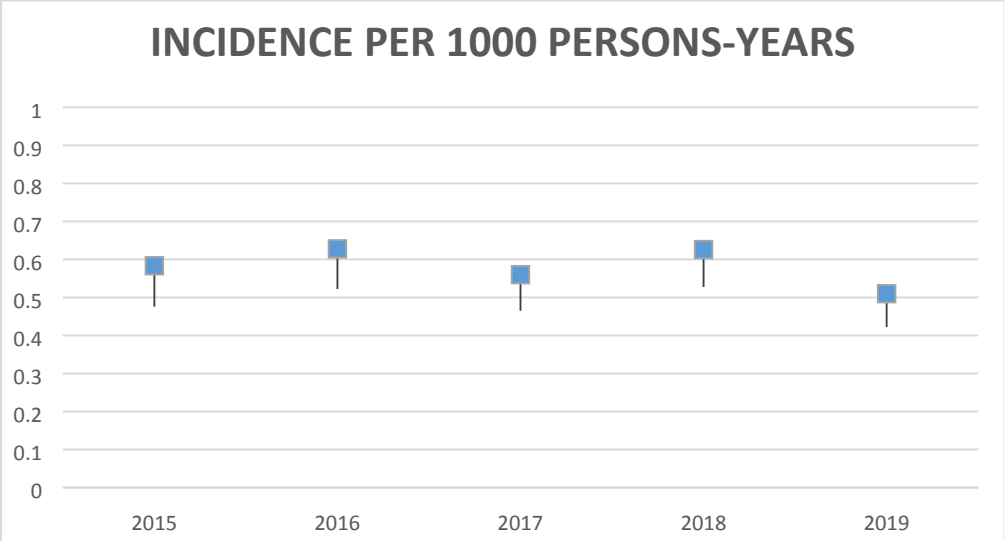


* Exclusion Dutch words: voet, teen, tenen, knie, enkel, wervel, rib, schouder, heup, achil, bicep, clavi, rug, olecr, bil, patel, hiel, been, quadric, abduc, adduc, bekken, benen, lies, ellebo, wreef, kuit, hak, calcaneus

Figure 1. Flow diagram study population

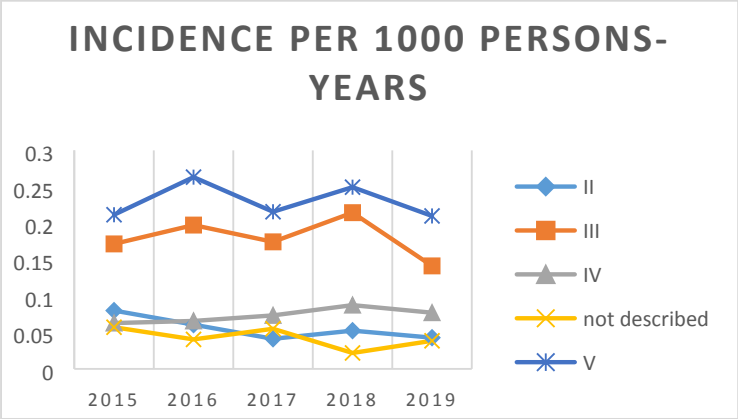
The number of patients aged ≥18 years in the RPCD ranged from 185,093 in 2015 to 254,345 in 2019. The query showed 127, 147, 142, 181 and 149 unique potential cases of MF from 2015 to 2019, respectively. Of the 200 potential MF cases assessed over the entire study period, 161 were a case (PPV 0.81). Using the annual PPV, the number of patients per year with an actual MF, concerned 102, 124, 122, 143 and 119 from 2015 to 2019, respectively. The annual incidences of MFs per 1000 persons-years are displayed in figure 2.

Figure 2. Annual incidence of mallet fingers per 1000 persons-years.



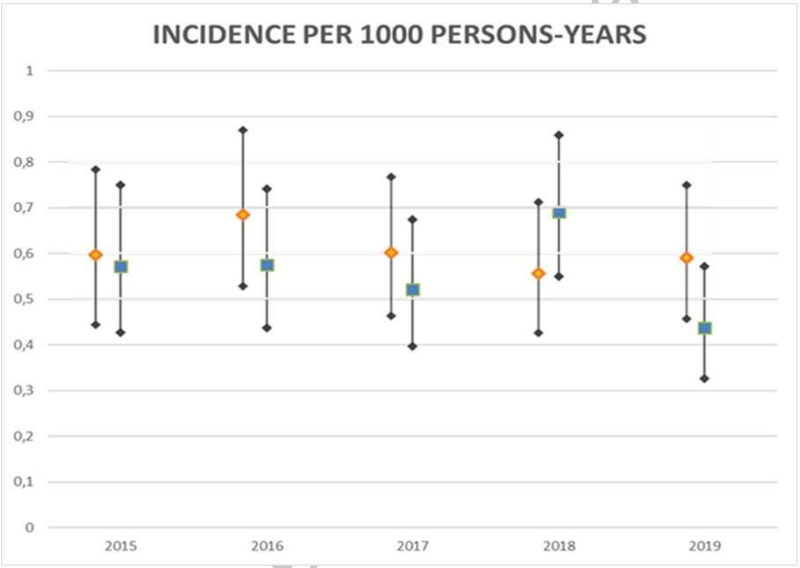
The mean incidence over the study period was 0.58 (95% CI = 0.48 to 0.69) per 1000 persons–years and ranged from 0.51 in 2019 to 0.63 in 2016 and 2018. The mean age at diagnosis was 53 (SD 15,4) (range 18 – 91) years. The fingers affected are displayed in figure 3. Digit III and V were the most common injured fingers. A MF of the thumb was not observed during the study period. Of note, some of the medical records did not describe which finger was affected (n=44).

Figure 3. Annual incidence of mallet fingers per 1000 persons-years, stratified per finger.



Men had a mean incidence rate of 0.60 (95% CI = 0.46 to 0.77) per 1000 persons–years and women 0.56 (95% CI = 0.43 to 0.72) per 1000 persons–years. Peak incidence was between 41-60 years for men and 61-80 years for women (see Figure 4).

Figure 4. Annual incidence of mallet fingers per 1000 persons-years for males and females.



Management

Of the patients with a MF, 93% (n=150) were initially diagnosed and managed by the GP and others at the emergency department of a hospital. For the patients initially evaluated in primary care, the mean number of consultations with the GP were 2 (IQR 1-2). The trauma mechanisms, total and stratified for age categories, are shown in table 1. Households (16%) and leisure (18%) were most noted causes for a mallet finger. In 38% of the cases, it was not possible to determine the trauma mechanism.

Table 1. Trauma mechanisms for the development of mallet fingers, stratified by age-categories.

Trauma mechanism	18-40 Number (%)	41-60 Number (%)	≥ 61 Number (%)	Total Number (%)
Households	5 (13,9)	8 (11,3)	13 (24,1)	26 (16,1)
Leisure	6 (16,7)	11 (15,5)	12 (22,2)	29 (18,0)
Others	3 (8,3)	10 (14,1)	4 (7,4%)	17 (10,6)
Sport	8 (22,2)	5 (7)	4 (7,4)	17 (10,6)
Work	3 (8,3)	8 (11,3)	0 (0)	11 (6,8)
Not described	11 (30,6)	29 (40,8)	21 (38,9)	61 (37,9)
Total	36 (100)	71 (100)	54 (100)	161 (100)

In 58% (n=93) of the cases, a radiograph was taken at or directly after the first presentation. Among these, 23% (n=37) of cases had an osseous MF confirmed by radiography, 35% (n=56) had a tendon MF, and for 42% (n=68) no distinction could be made.

Table 2. Management of mallet finger cases at initial consultation, adjustment to initial management strategies and final management strategies including adjustments.

Management GP	Management strategy at initial consultation, frequency (%)	Additional management strategy, frequency (%)	Final management strategy, frequency (%)
Conservative treatment in GP practice	75 (50%)		64 (43%)
Referral to secondary care	62 (41%)	6	68 (45%)
Avulsion fracture	25		25
Not described	31		31
Other reason	6	3	9
Delayed recovery		3	3
Referral to a paramedic professional	6 (4%)	5	11 (7%)
Not described	7 (5%)		
Total	150	11	150

Referral to a secondary care specialist after the initial assessment by the GP, was the most applied strategy (45%), followed by conservative treatment in GP practice (43%) and referral to a paramedical professional (11%). Of the patients in whom the GP initially started conservative treatment in GP practice, during follow up, 6 (8%) patients were referred to a specialist and 5 (7%) to a paramedic professional (see Table 2). The minimum and maximum number of weeks after which the patient was referred were 1-14 weeks (mean 8.5 SD 4.97) for secondary care specialist and 6-12 weeks (mean 8.4 – SD 2.6) for paramedical professionals, respectively.

Two percent (4/161) of patients with a MF underwent surgery within 6 months of their initial presentation. The mechanism of origin of the MF involved a high-energy trauma in two patients (finger caught between a trailer and bus and falling from a height) and the trauma mechanism was unknown in the other two patients. Three patients had an intra-articular avulsion fracture and in the fourth patient a MF without a fracture (tenodermadesis) was diagnosed.

Discussion

Summary

To the best of our knowledge, this study is the first study that determined the mean incidence of a MF in primary care, which was 0.58 per 1000 persons–years. Indicating that on average, a GP with an average practice size of 2100 patients assesses ±1 patient with a MF per year. In a majority of patients (58%) the GPs requested radiography and in only 2% of patients with MF surgical treatment was required. Based on our study, the recommendation in the guidelines to perform radiography in all patients with MF should potentially be reconsidered. Referral to secondary care and conservative treatment in the GP practice were the dominant management strategies.

Strengths and limitations

The RPCD population is representative for the general Dutch population in terms of age and sex, see appendix 1. The geographical spread is limited, but GP practices are located both in urban and non-

urban areas. Despite the limited geographical spread, we do not expect that this will have influenced our results, because mallet finger injuries are frequently sustained during either work or participation in sports, and is most common in adult men; all of which are well represented within the studied population.[16] There is no selection on type of health insurance or social economic status of patients in RPCD.[11] The use of registration data can been seen as a strength of this study; GPs were not influenced in their management approach in this study, and it can therefore be assumed that the study provided a true representation of the management of MFs performed by the GPs. Despite that all Dutch citizens are registered at and managed by GPs, it is possible that patients with a MF have been diagnosed and managed by a paramedical professional without first being assessed by a general practitioner, possibly resulting in a higher incidence rate of MFs in primary care than described in this study. In the Netherlands patients have direct access to a paramedical professional without requiring a referral from the GP. Selection bias may have occurred in this study due to the dependence on 1) the diagnostic accuracy of the GP in making the diagnosis of MF, and 2) (in)adequate reporting in the medical file by the GP.[17] Since this study was dependent on GP medical records, the incidence can be considered as the incidence of registered consultations only. To limit the possible underestimation of the overall incidence due to limited medical notes or non-uniform ICPC coding, multiple ICPC codes and free-text terms were used to identify patients with MFs. Another limitation could be that management results of medical specialist are only available if the specialist sends communication to the GP and the GP has adequately processed the content of the letter. This could have given a slight underestimation of the real number of patients that receive imaging and a certain (surgical) treatment in the hospital.

Comparison with existing literature and guidelines

A mean incidence of 0.58 (95% CI = 0.48 to 0.69) per 1000 persons–years was found in our study. Peak incidence was between 41-60 years of age for men and 61-80 years for women. Currently, to the authors' knowledge, literature regarding the incidence and management of MF in primary care is

lacking**.** One large retrospective study of MFs at a UK hospital's emergency department reported an incidence of 9.9/100 000 patient-years.[18] This study also described that a mallet finger was most common in men aged 25-55 years and that the incidence began to drop after the fifth decade, at which it becomes equal to the incidence in females. Based on the study of Clayton, one could hypothesize that men in the age category of 25-55 years with MFs are more likely to be assessed by the emergency department than by a general practitioner.[18] In the current study, the incidence of a MF was 6 times higher than was reported at the emergency department. Potentially, most patients with a mallet finger, both in the Netherlands and in the UK, first report to a general practitioner, who can refer these patients to secondary care, if necessary, without attending an emergency department.

Based on the results of the current study, it seemed that the GPs did not adhere to the current literature and several guidelines, as not all patients with a MF underwent guideline recommended imaging.[5, 6, 19, 20, 21] According to current literature and (inter)national guidelines, radiography should always be recommended, to differentiate between an osseous mallet injury (assessment articular surface) and a tendinous one and assessment of volar subluxation of the distal phalanx. Remarkably, in the current study, imaging was only used in a limited number of all cases (58%). [5, 6, 19, 20] Imaging is advised in the guidelines because patients with an osseous MF with an avulsion fragment larger than 30 to 40% of the joint surface and/or a volar subluxation of the distal phalanx surgery should be considered.[6, 19, 20, 21] In a long-term follow-up study, complications of treatment in 123 operatively and non-operatively treated MFs were reviewed.[22] In the 84 digits treated with splints, there was a 45% rate of complications (e.g., skin, transverse nail grooves, and pain), which were almost always transient, and the complication often depended on the splint type selected. For the 45 surgically treated digits, the complication rate was 53% (e.g., nail deformities, joint incongruities, infection, pin, or pull-out wire failure, radial or ulnar prominence or deviation of the DIP joint), with 76% of these complications still being present after a mean follow-up of 38 months.[22] Redislocation occurred in seven digits (16%), requiring additional surgery.[22] Based on these results, the authors advocated for

splinting in the treatment of almost all MF injuries. Another long-term follow-up study, focusing on osteoarthritis (OA) of the distal interphalangeal (DIP) joint after a MF fracture, showed that the rate of radiological OA development after a MF fracture was almost equal to the natural degenerative process in the DIP joint in the absence of prior MF fracture and was accompanied by a decrease in range of motion of the DIP joint, which did not clinically affect patient related outcome measures.[23] Therefore, conservative treatment of MF was advocated. The current study showed that only 2% eventually had to undergo surgery. Based on this knowledge, the purpose of requesting radiographs should not be to distinguish between a tendinogenic or osseous MF, but to assess whether there is a possible indication for surgery. Based on results from the literature described above and the low percentage of patients who underwent surgical intervention in current study, the guideline recommendations to perform radiography in all patients with MF should potentially be reconsidered. Requesting radiographs is only be recommended if the mallet finger has developed after high energy trauma (e.g. crush injuries).

Based on current (inter)national guidelines, clinicians are advised to assess patients with MF on a regular basis and to evaluate the effect of conservative therapy or to consider hand therapy to accurately guide the non-surgical splinting and post-operative treatment of osseous mallet fingers.[6, 17, 19,21] Nevertheless, in current study GPs treated patients with MF differently, given the limited number of GP consultations (median 2), few referrals to a paramedic professional (11%), and many referrals to a secondary care specialist (45%).[6, 17, 19, 21]

Implications for research and practice

In the Netherlands, a GP sees on average one patient per year with a MF and two percent (4/161) of patients with a MF underwent surgery in the first six months after initial presentation. Based on the current literature and guidelines, radiography is always advised for a patient with a MF. Future research should investigate the added value of imaging in all patients with a MF in primary care, given the low number of patients that underwent surgery. There was a discrepancy between the

current guidelines and how GPs treated patients with MF in clinical practice. Future research should investigate why GPs don't refer all MF patients for radiography and why they refer more often to a secondary care specialist rather than to a paramedical professional.

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Supplementary material

No supplementary data

Ethical approval

This study was approved by the Governance Board of Rijnmond Primary Care (project number 2021-22). Patient data was deidentified for research purposes. Patient consent was therefore not required.

Author contributions

P.K., J.R, and S.B.Z. conceived the study. P.K., A.B., D.V. and J.R. performed statistical analysis and made graphic images. Interpretation of the data was done by P.K., E.I.T.d.S., G.K., J.R.. P.K., J.R. wrote the manuscript, which was revised by all authors. All authors reviewed and approved the final manuscript.

Conflict of interest

The authors declare no conflict of interest.

Data availability

Data not publicly available.

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