

ARE ROUTINE RADIOGRAPHS DURING CONSERVATIVE TREATMENT OF FRACTURES OF THE FOURTH AND FIFTH METACARPALS USEFUL ?

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In two retrospective studies we investigated the additional information provided by follow-up radiographs during the conservative treatment of fractures of the fourth or fifth metacarpal. In the first study we evaluated the number of follow-up radiographs made and their actual influence on the treatment. In 307 consecutive cases, 0-9 (mean 1.93) follow-up radiographs were made. Two cases (0.6%) revealed additional information influencing the treatment policy. Based on physical examination, this alteration was already expected prior to taking the radiograph. In a complementary radiological study, in only one out of 466 (0.2%) follow-up radiographs of 288 selected conservatively treated fractures, relevant information would possibly have been missed, had follow-up radiography been selective only. Residual symptoms (subjectively diminished function, stiffness, pain or intolerance to cold) cannot be prevented by taking more radiographs. During the treatment of these fractures, follow-up radiographs are only indicated if physical examination suggests loss of reduction or instability within one week of the fracture.

Keywords : fracture ; hand ; metacarpal ; radiograph ; xray.

Mots-clés : fracture ; main ; métacarpe ; radiographie.

INTRODUCTION

Fractures of the fourth and fifth metacarpals account for 35% of all hand fractures, and for 12%-18% of all upper extremity fractures (1, 11, 14, 21).

Metacarpal fractures are usually treated conservatively. After radiographic confirmation of the fracture, a reduction might be performed, followed by radiographic evaluation. Routine radiographs

are usually made after 1 week, and radiographic consolidation of the fracture is often confirmed once the cast has been removed. However, no reports showing the additional value of these follow-up radiographs are available. Superfluous radiography during treatment of hand fractures may thus lead to unnecessary costs.

In a two-part study we evaluated, retrospectively, the number of control radiographs made, and their additional value to the treatment strategy, radiological and clinical results.

PATIENTS AND METHODS

The study consists of two parts. In the first part we evaluated the present use of radiography in 307 consecutive patients with a fractured fourth or fifth metacarpal. We investigated the number of follow-up radiographs made and their influence on the treatment policy.

In the second part we evaluated whether radiographic information influencing treatment might have been lost if radiographs had been made during the initial visit, but afterwards only if physical examination indicated a possible instability or change in position of the fracture.

Part 1

We used the records of 309 consecutive patients with a fracture of the fourth or fifth metacarpal, who were

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seen at the orthopedic emergency room of the Maasland Hospital between August 1988 and May 1993. Two patients were excluded because their records were incomplete. The remaining 251 men and 56 women were aged between 6 and 72 years (mean 29.1). Fracture type and localization, therapy, and the number of radiographs taken were noted for all patients. We evaluated the influence of the follow-up radiographs on the treatment plan.

Part 2

Between January 1988 and January 1994, 342 patients with a fracture of the fourth or fifth metacarpal were seen at the orthopedic emergency room of the University Hospital Maastricht and the Maasland Hospital Sittard. All patients had been treated conservatively. Patients were selected if one or more standardized follow-up radiograph was available (5). We excluded 54 patients: 36 had moved elsewhere, 11 were imprisoned, 3 were mentally disabled and 1 had died. Three patients refused to be included. All remaining 288 patients were arbitrarily numbered to prevent observer bias. For all patients the first author studied the emergency-room reports, the emergency-room radiographs (including the radiograph after reduction) and the findings during physical examination at the follow-up visits, such as suspected change in position of the fracture or rotation. The radiographs made during these later visits were not used. Based only on this limited information, i.e. without studying the follow-up radiographs, the author judged the necessity of making a follow-up radiograph or changing the initial treatment plan. We defined the following radiographic findings on the emergency-room radiographs (or if reduced, on the radiograph after reduction) as criteria necessitating a follow-up radiograph: extra-articular subcapital angulation exceeding 50° ; midshaft angulation exceeding 15° ; or shaft contact of less than 2/3. Proximal fractures were evaluated according to the degree of comminution or dislocation. The same evaluation was done for all subsequent follow-up visits.

To find out what additional relevant radiographic information had been missed by not making follow-up radiographs, the same procedure was repeated two months later, but now all available follow-up radiographic information was included in the assessment. The difference in recommended treatment in the two situations was evaluated.

All 288 patients received and returned a questionnaire about residual symptoms. All but one patient who reported having residual symptoms were examined

physically. One refused examination. Mobility and stability were measured. Power grip was tested using a digital Jamar grip-strength meter (4, 8, 9, 10, 17). Static pulling strength was measured by means of a steelyard. The contralateral side was used as a reference after correction for manual dominance (12).

We evaluated whether residual symptoms bore any relation to residual radiographic deformity, and whether these symptoms could reasonably have been prevented by taking radiographs at more frequent intervals.

RESULTS

Part 1

In the first study, two out of 307 (0.7%) patients underwent primary internal fixation because of fracture instability. One conservatively treated patient with a subcapital fracture of the fifth metacarpal had been operated on 5 weeks after the fracture because of a late rupture of the extensor tendon. This patient is scored as *conservative* fracture treatment (see table I). The fracture angulation ranged from 0° to 79° (mean 16.7°).

We treated 118 (38%) patients with an ulnar-gutter splint, 76 (25%) with a circular cast, 88 (29%) with a volar splint, and 25 (8%) with a bandage. In addition to any initial reduction radiographs, one or more control radiographs were made in 173 (56%) patients (table II).

Table I. — Fracture localization according to reduction and treatment

Reduction		No reduction		Total	Localization
Cons.	Oper.	Cons.	Oper.		
Metacarpal 5 :					
49	—	81	—	130	distal
25	2	31	—	58	midshaft
4	—	47	—	51	proximal
3	—	9	—	12	combination
Metacarpal 4 :					
1	—	8	—	9	distal
8	—	20	—	28	midshaft
2	—	15	—	17	proximal
2	—	—	—	2	combination
94	2	211	0	307	TOTAL

Cons. = conservative treatment; Oper. = operative treatment.

Table II. — Frequency of radiography

	only initial radiograph	Number of follow-up radiographs			TOTAL number of fractures
		1 follow-up radiograph	2 follow-up radiographs	≥ 3 follow-up radiographs	
Series 1 : n = 307					
No reduction	118	75	29	1	223
Reduction	16	34	26	8	84
TOTAL	134	109	55	9	307
Series 2 : n = 288					
No reduction	**	97	89	5	191
Reduction	**	40	49	8	97
TOTAL	**	137	138	13	288

No reduction : number of radiographs in the no-reduction group.

Reduction : number of radiographs in the reduction group.

(radiograph after initial reduction not included).

** : in the second series, only patients for whom one or more radiographs were available were included.

Note that in series 1, follow-up radiographs have been made in the no-reduction group in 47%, and in 19% only initial radiographs in the reduction group.

Each patient underwent 0 to 9 (mean 1.93) control radiograph series in two or more planes. Only two of the 334 (0.6%) control radiographs altered the initial treatment plan. In both cases the patient's record stated that this already was expected prior to radiography because on the physical examination, a change in fracture position was assumed to have occurred. In two other patients we decided to prolong the immobilization after evaluation of the 4-week control radiograph. One of them had experienced a refracture due to new trauma. In the other case, after review of the 4-week follow-up radiograph, we concluded the decision to prolong the immobilization had been made erroneously.

Part 2

In the second study, after retrospectively examining the emergency reports, the emergency radiographs and only the notes of the physical examination at follow-up, the author judged follow-up radiographs to be necessary in only four patients (1.4%).

In actual fact, in three of them the treatment had been changed owing to the additional radio-

graphic information. In the last one the radiograph did not provide supplementary information and the actual treatment had not been influenced.

If none of the other 462 follow-up radiographs had been made, the one radiograph showing increased angulation, that might have led to advising renewed reduction, would have been missed. In actual fact in this patient secondary reduction was not performed either. This patient however remained free of any residual symptoms or malfunction, indicating that absence of the radiologic information in this patient would not have adversely affected his clinical outcome. None of the other radiographs added any information that would have altered the initial treatment plan.

Fifty-two patients (18%) complained of (subjectively) diminished grip strength, pain or intolerance to cold and 23 (8%) of them reported stiffness. These symptoms bore no relation to residual angular deformity. However, nine patients (3%) had a minor malrotation. In one patient the extension deficit of 15° was related to consolidation of a subcapital fracture of the fifth metacarpal with an angulation exceeding 70°. This patient refused surgery despite nine unsuccessful attempts at re-

duction. On the basis of the physical examination, a follow-up radiograph had been judged necessary in this patient.

DISCUSSION

In neither of the studies could we demonstrate any additional value of routine follow-up radiography during the conservative treatment of fractures of the fourth or fifth metacarpals. The authors are not aware of any series showing its effectiveness.

In the first study, only 2 of 334 (0.6%) of the follow-up radiographs revealed additional information influencing the treatment policy. This information was already expected prior to making the radiograph.

In the second study, relevant information would have been missed in only 1 of 466 (0.2%) follow-up radiographs, if these radiographs had been made selectively using the "radiographic criteria" mentioned, this would not even have had any adverse consequences for the patient.

There is no consensus about the degree of deformity that can be accepted in the fourth or fifth metacarpals. For our "radiographic criteria" we opted for the mean deformity accepted in the literature. Evaluation of the residual symptoms in relation to the residual deformity confirms that these criteria are adequate.

Because our previous evaluation of the radiographic routine during treatment of metacarpal fractures in 10 other hospitals throughout the country showed, apart from some negligible differences, a similar policy to our hospital, the results from our clinics can be assumed to be generally applicable.

Based on theoretical grounds, routine radiographic examination does not seem justified. Residual angulations in the fourth or fifth metacarpal seldom produce functional restrictions (2, 5, 6, 7, 13, 15). This is because of the relatively large degree of mobility at the fourth and fifth CMC and MCP joints (3, 16). Often the reduction in these metacarpals is totally or partially lost, independent of the external immobilization or reduction technique used (7, 18, 20). This was con-

firmed in the present study. Adequate repeated reduction is hardly possible one week after the initial fracture. Consequently, follow-up radiographs made at that time are of little or no therapeutic use.

Rotational deformities can only be reliably assessed by means of physical examination and not by using plain radiographs.

Routine follow-up radiography during conservative treatment of fractures of the fourth and fifth metacarpals can safely be avoided. Only if a change in fracture position is suspected during physical examination within one week of the fracture is a new radiograph indicated. Rotational deformities deserve special attention (15).

In the authors' opinion, fear of malpractice claims should not lead to ordering unnecessary radiographs because this action has been proven to influence neither the treatment policy nor the patient outcome. If followed, this policy will diminish the amount of radiography by half without compromising optimal treatment.

Acknowledgments

We thank Mrs. B. S. Vollers-King for language editing.

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SAMENVATTING

M. BRAAKMAN, A. D. VERBURG, E. E. ODERWALD. Routinematige radiologische controle is bij de behandeling van metacarpale 4 en 5 fracturen niet zinnig.

In twee retrospectieve studies onderzochten wij de additionele waarde van controle-foto's bij de conservatieve behandeling van metacarpale 4 of 5 fracturen.

In de eerste studie werd onderzocht hoeveel controle-foto's werden gemaakt en of deze foto's de behandeling ook daadwerkelijk beïnvloedden. Van 307 patiënten werden 0-9 (gem 1,93) controlefoto's gemaakt. Slechts

twee foto's (0,6%) leverden aanvullende informatie op welke tot beleidsverandering leidde. Dit werd op basis van het lichamelijk onderzoek reeds verwacht vóór het maken van de foto.

In een aanvullende röntgenstudie bleek in slechts 1 van de 466 (0,2%) controlefoto's van 288 geselecteerde conservatief behandelde patiënten mogelijk relevante informatie gemist te worden, indien controle foto's slechts selectief zouden worden aangevraagd.

Restklachten (subjectief functieverlies, stijfheid, pijn en koude intolerantie) kunnen niet worden voorkomen door frequenter foto's te vervaardigen.

Controle foto's zijn alleen geïndiceerd indien binnen een week na de fractuur bij klinisch onderzoek tussentijdse standsverandering of instabiliteit wordt vermoed.

RÉSUMÉ

M. BRAAKMAN, A. D. VERBURG, E. E. ODERWALD. Des contrôles radiographiques de routine sont-ils utiles dans le traitement conservateur des fractures des 4^{ème} et 5^{ème} métacarpiens ?

À la suite de deux études rétrospectives, les auteurs ont évalué l'intérêt des radiographies de contrôle, durant le traitement conservateur des fractures des métacarpiens IV et V. Dans la première étude, il s'agissait d'évaluer l'ensemble des radiographies de contrôle et de relever leur influence sur le traitement.

Pour les 307 cas successifs, 0-9 radiographies de contrôle (moyenne 1,93) ont été réalisées. Seulement deux (0,6%) de ces radiographies ont fait apparaître des éléments nouveaux qui avaient modifié l'attitude thérapeutique. L'examen clinique précédant la radiographie révélait déjà ces indices.

Dans la seconde étude, portant sur 288 fractures, 466 radiographies de contrôle ont été réalisées au total ; si les radiographies de contrôle avaient été faites de façon sélective, ce n'est que pour une seule des 288 fractures (0,2%) qu'une information significative aurait échappé. La multiplication des radiographies n'est pas le moyen de prévenir des symptômes résiduels.

Durant le traitement de ces fractures, des radiographies de contrôle sont souhaitables seulement quand l'examen clinique décèle un déplacement secondaire ou une instabilité.