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1 **Treatment of calcinosis cutis in systemic sclerosis and dermatomyositis: a review of the**
2 **literature**

3

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42 **Abstract:**

43 **Background:** We have limited data on the treatment of calcinosis cutis associated with
44 systemic sclerosis (SSc) and dermatomyositis (DM).

45 **Objective:** To assess the efficacy and tolerance of available treatments for calcinosis cutis
46 based on previously published studies.

47 **Method:** We performed a systematic review of studies published in MEDLINE, Embase, and
48 the Cochrane library between 1980 and July 2018. The strength of clinical data was graded
49 according to the modified Oxford Centre for Evidence-Based Medicine Levels of Evidence.

50 **Results:** In all, 30 studies (288 patients) were included. Eleven therapeutic classes, surgery
51 and physical treatments were identified as potential treatments for calcinosis cutis. From the
52 results of a small randomized controlled trial and 4 retrospective studies, low-dose warfarin
53 should not be used for calcinosis cutis (Level IB evidence). Several studies suggested the use
54 of diltiazem and bisphosphonates (Level IV). Considering biologic therapies, rituximab has
55 shown interesting results in both DM and SSc, whereas TNF inhibitors may be useful in
56 juvenile DM (Level IV). Intralesional sodium thiosulfate may be a promising alternative
57 (Level IV).

58 **Limitations:** Few included studies had a high level of evidence.

59 **Conclusion:** This study highlights the efficacy and tolerance profiles of available treatments
60 for calcinosis cutis, with a focus on level of evidence.

61 **Key words:** calcinosis cutis, systemic sclerosis, dermatomyositis, level of evidence

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64 INTRODUCTION

65 Calcinosis cutis is defined by the deposition of insoluble calcium in the skin and
66 subcutaneous tissues.¹ DM and SSc are the most frequent autoimmune connective tissue
67 disorders associated with calcinosis cutis.² Indeed, calcinosis cutis develops in about 30% of
68 adult DM patients³ and 30% to 70% of juvenile DM patients.⁴⁻⁷ Moreover, the prevalence of
69 calcinosis ranges from 18% to 49% in SSc patients.⁸⁻¹² Significant advances in understanding
70 the SSc and DM pathogenesis, newer classification criteria and advances in disease
71 management have resulted in improved survival in SSc and DM.^{4,5,13} Nevertheless, long-term
72 morbidity remains a major issue.^{14,15}

73 Dystrophic calcinosis is associated with considerably impaired quality of life due to
74 ulceration and secondary infections, both resulting in extreme debilitation.^{7,16} Although early
75 aggressive intervention may prevent calcinosis cutis development,¹⁷⁻¹⁹ treatment remains
76 challenging. Furthermore, few randomized controlled trials (RCTs) have been performed²⁰
77 and we lack specific guidelines for calcinosis cutis management in DM or SSc. However,
78 several case series or prospective cohort studies focusing on calcinosis cutis treatment have
79 been published.²¹

80 To better define an evidence-based treatment approach and to provide the best available
81 evidence for physicians, we performed a systematic review of case series and cohort studies
82 investigating the management of calcinosis cutis in patients with DM or SSc.

83

84 MATERIAL AND METHODS

85 This systematic review was performed according to the 2009 Preferred Reporting Items for
86 Systematic Reviews and Meta-Analyses (PRISMA) checklist.²²

87 Literature search and information sources:

88 We performed a systematic review of MEDLINE/PubMed, Embase and the Cochrane
89 database between January 1980 to July 2018, with no restriction on language. The search
90 strategy combined free text search, exploded MESH/EMTREE terms and all synonyms of the
91 following Medical Subject Headings terms: systemic sclerosis, dermatomyositis, calcinosis
92 cutis. The grey literature was also explored to avoid publication bias. We also searched for
93 additional articles from the reference lists of relevant papers.

94 Study selection and eligibility criteria

95 Observational studies or RCTs were considered if 1) they included patients with DM or SSc;
96 2) the number of patients with calcinosis cutis was available; 3) patients received a specific
97 treatment for calcinosis cutis or for the connective tissue disease with a specific assessment of
98 calcinosis cutis outcomes; and 4) the number of patients treated and the number of responders
99 were available. Given the rarity of calcinosis cutis but to avoid publication bias based on
100 single case reports, we excluded case series of fewer than 3 patients along with reviews,
101 editorials and guidelines (**Figure 1**). The quality of studies was assessed by the Newcastle-
102 Ottawa Assessment Scale²³ for observational studies and the Cochrane collaboration Risk of
103 Bias tool²⁴ for RCTs.

104

105 **Data extraction and assessment of calcinosis cutis outcomes**

106 The post-treatment calcinosis cutis response was reported as complete or partial. Complete
107 response was defined as the complete disappearance of calcinosis cutis, and partial response
108 was any improvement according to the study protocol, which included reduction in the size of
109 calcinotic deposits and healing of ulcerations. When only pain reduction was reported, the
110 treatment was considered a failure. Adverse events were recorded. The relapse rate was
111 defined as the reappearance of lesions after a complete or partial response. All data were
112 extracted independently by 2 investigators. In the tables, when data were available, adult and
113 pediatric patients are presented separately.

114 **Levels of evidence and treatment recommendation:**

115 The strength of clinical data and subsequent treatment recommendations were graded
116 according to the modified Oxford Centre for Evidence-Based Medicine Levels of Evidence
117 and Grades of Recommendation.²⁵

118

119

120 RESULTS

121 Literature search and characteristics of included studies

122 Our literature search identified 3032 citations; reports for 30 studies^{10,20,26–53} were included
123 in this systematic review (**Figure 1**), including 2 RCTs,^{20,30} 11 prospective cohort
124 studies^{31,32,36,43–48,51,53} and 17 retrospective studies.^{10,26–29,33–35,37–42,49,50,52} The sample size
125 ranged from 3 to 78 patients, for a total of 288 patients (SSc=108, adult DM=66, juvenile
126 DM=90, and DM or SSc but unspecified diagnosis=24).

127 Overall, the methodological quality of included studies was low, with 26 cohort studies
128 graded as poor quality and only 2 as fair quality.

129 **Warfarin:** Warfarin, a vitamin-K antagonist, was used in one RCT²⁰ and 4 retrospective
130 studies^{26–29}, with a total of 19 patients (DM=10, SSc=6, unspecified=3) (**Table 1**). A dosage
131 of 1 mg/day was most commonly prescribed. The mean calcinosis cutis duration was from 4
132 months²⁷ to 10 years.²⁶ A small placebo-controlled trial²⁶ found no clinical improvement in
133 calcinosis cutis in 5 patients who received warfarin 1 mg/day. From the results of 5 studies,
134 the partial response rate ranged from 0%^{20,26,29} to 2/3 (66%)^{28,54}, with no complete response
135 observed in all but one study (2/3; 66%).⁵⁴ No relapse was observed after 2 years' follow-up
136 in one study.²⁷ Adverse events were not reported.

137 **Diltiazem:** Diltiazem, a calcium channel blocker, was used in 3 retrospective cohort studies
138 in 38 patients (DM=12, SSc=12, unspecified =14)^{10,28,29} (**Table 1**). The dosage ranged from
139 60 mg 3 times daily to 480 mg/day. The partial response rate ranged from 0/12 (0%)²⁹ to 9/14
140 (64%).²⁸ No complete responses were reported in the 3 studies and no adverse events were
141 reported in the study of Vayssairat et al.¹⁰

142 **Rituximab:** Rituximab was used in 7 studies (SSc=18, adult DM=9, juvenile DM=32)
143 including 3 prospective studies,^{31–33} 3 retrospective studies^{29,34,35} and one RCT versus placebo

144 focusing on the efficacy of rituximab on skin lesions including calcinosis cutis.³⁰ Study
145 characteristics are summarized in **Table 2**. The mean calcinosis cutis duration ranged from
146 3.4 to 12 years.^{33,34} From the results of 6 studies, the partial response rate ranged from 0/6
147 (0%)³⁴ to 100% in 3 studies including 3 to 9 patients.^{31,32,35} The complete response rate
148 ranged from 0%^{29,33,34} to 100% in a study of 3 SSc patients.³¹ In 2 studies, the relapse rate
149 was 0% with a follow-up of 12 to 60 months.^{31,35} Adverse events were assessed in 3 studies
150 and included localized bacterial infection of the calcinosis (n=2), moderate acute infusion-
151 related events (n=1), and intestinal perforation 2 weeks after a combination of rituximab and
152 pulse methylprednisolone infusions (n=1).

153 **Other biologic agents:** Tumor necrosis factor α (TNF- α) inhibitors and abatacept (CTLA4-
154 Ig) were used in 4 studies^{29,36-38}, with a total of 30 DM patients (mostly juvenile DM). The
155 results of 3 infliximab studies^{29,36,38} showed a partial response rate ranging from 0% (0/2)²⁹ to
156 80% in a prospective study of 5 juvenile DM patients³⁶. No complete responses were noted
157 and adverse events were not reported.

158 **Bisphosphonates:** Four retrospective cohort studies of 17 individuals (DM=15, unspecified
159 =2)^{28,39-41} assessed the efficacy of bisphosphonates for calcinosis cutis (**Table 3**). Specific
160 bisphosphonates and the therapeutic regimens were heterogeneous. The partial response
161 ranged from 3/6 (50%)⁴⁰ to 3/3 (100%)³⁹ and the complete response rate from 0% to
162 33%.^{28,39-41} In 2 patients receiving pamidronate with complete response, one relapse was
163 noted after 4 years; in this case, alendronate was then used, which resulted in a second
164 complete response. No adverse events were recorded in the only study assessing safety.⁴¹

165 **Intravenous immunoglobulins:** Two retrospective studies including 15 DM patients^{29,42}
166 assessed the efficacy of intravenous immunoglobulins on calcinosis cutis. Galimberti et al.⁴²
167 reported a partial response in 5/8 (62%), with no complete responders. Conversely, no

168 objective response was observed in the study of Fredi et al.²⁹ including 7 DM patients, with
169 only one reporting pain improvement. Adverse events were not reported in these studies.

170 **Sodium thiosulfate (STS):** Five studies^{29,48-51} assessing different regimens of STS or its
171 metabolites involved 20 patients (SSc=9, adult DM=10, juvenile DM=1). Two studies^{48,49} of
172 7 patients assessed the efficacy of intravenous STS. No objective improvement was found,
173 and pain improvement was noted in only one patient.⁴⁹ Topical STS conferred no
174 improvement in 5 DM patients.²⁹ Partial response was achieved with topical sodium
175 metabisulfite (a metabolite of STS) in 3/3 patients (2 DM and 1 SSc), without relapse,⁵⁰
176 including one with complete response. Finally, in a prospective study, partial response was
177 achieved in 5/5 SSc patients, including complete response in 2 receiving intralesional STS
178 injection.⁵¹ Adverse events of intralesional STS included transient pain (n=2/5) and local
179 infection (n=1/5).⁵¹

180 **Minocycline:** Minocycline (50-200 mg/day) was used in 2 studies of 12 patients (SSc=9,
181 unspecified=3).^{28,52} Robertson et al.⁵² reported a partial response in 8/9 patients and Balin et
182 al.²⁸ a partial response in 1/3. Adverse events included nausea (n=1), dizziness (n=1) and the
183 conversion of calcinosis cutis deposits to a blue/black color.⁵²

184 **Colchicine:** Balin et al.²⁸ found a partial response in 3/7 patients (43%), including 1/7 with
185 complete response using colchicine doses < 1.2 mg/day. Fredi et al.²⁹ reported only 1/9
186 partial response with colchicine.

187 **Cyclophosphamide:** One prospective study used cyclophosphamide for treating refractory or
188 severe juvenile DM, including 14 patients with calcinosis cutis.⁵³ Complete response of
189 calcinosis cutis was noted in 9/14 (64%), with a follow-up between 12 and 24 months.

190 **Surgery and physical therapies:** Five prospective studies and one retrospective study (n=55
191 patients: SSc=26, DM=1, unspecified=28) assessed surgical intervention and physical therapy

192 for calcinosis cutis improvement^{28,43-47} (**Table 3**). Surgical excision in 2 studies led to 80%
193 improvement.⁴⁷ Balin et al.²⁸ reported a partial response of 27/28 (96%), including 22/28
194 (79%) with complete response. Two small prospective cohort studies of 7 patients noted a
195 partial response rate of 33% to 100% with extracorporeal shock-wave therapy, with no
196 complete response.^{44,45} The relapse rate was not reported. Adverse events included transient
197 pain with extrusion of calcific debris. Another prospective study of 6 SSc patients reported a
198 partial improvement rate of 83% with a carbon dioxide laser.⁴³ Adverse events included poor
199 wound healing (n=5), hyperkeratosis (n=4) and postoperative infections (n=2). Relapse was
200 observed in 2/6 patients within 3 to 4 months.⁴³

201

202 DISCUSSION

203 In this systematic review, we identified 30 studies (288 patients) focusing on the treatment of
204 calcinosis cutis associated with SSc and DM. **Table 4** summarizes the available treatments
205 for calcinosis cutis with a focus on underlying diseases and levels of evidence.

206 Currently, we lack specific guidelines for managing calcinosis cutis in autoimmune
207 connective tissue disorders. In the recent consensus-based recommendations for the
208 management juvenile DM, an intensification of immunosuppressive therapy was suggested,
209 but no specific treatment was recommended.¹⁹ Moreover, treatment of calcinosis cutis is not
210 included in the updated EULAR recommendations for treating SSc.⁵⁵

211 From our systematic review, several drugs used to treat calcinosis cutis have potential
212 therapeutic interest. Because of the small number of patients and the treatment heterogeneity
213 among included studies, pooled response rates were not calculated. However, several
214 important findings may be underlined. From the results of a small RCT, warfarin conferred
215 no improvement in calcinosis cutis⁵⁶, and no partial response was observed in most included
216 studies.^{20,26,29} Therefore, warfarin should not be considered for treating calcinosis cutis. This
217 suggestion is further supported by the fact that warfarin could promote ectopic calcification
218 via under-carboxylated matrix gla protein.⁵⁷

219 Despite no complete response noted in the 3 studies of diltiazem, partial response was
220 observed in some, particularly in Balin et al., in 9/14 (64%) patients. Some data support the
221 use of calcium channel blockers for calcinosis cutis in SSc. Indeed, digital ischemia was
222 strongly related to the occurrence of calcinosis cutis in a large study of 1300 SSc patients,
223 and the use of calcium channel blockers was inversely associated with the presence of
224 calcinosis cutis in this study.¹² Moreover, the use of calcium channel blockers is
225 recommended for treating Raynaud phenomenon in SSc.⁵⁵ Therefore, although no formal

226 curative effect of diltiazem on calcinosis cutis could be demonstrated, a potential preventive
227 effect cannot be ruled out, and therefore diltiazem may be considered for treating digital
228 calcinosis cutis associated with SSc.

229 Rituximab has been increasingly used in DM and SSc because of favorable outcomes in DM
230 skin lesions³⁰ and SSc skin sclerosis and lung function.⁵⁸ From the results of 6 studies,
231 rituximab may be considered for treating calcinosis cutis both in DM and SSc. Indeed,
232 although one study of 6 juvenile DM patients did not reported improvement,³⁴ most studies
233 showed at least partial response, including 3 with 100% partial response.^{31,32,35} Moreover, 3
234 studies reported at least one patient with complete response.^{30,31,35} TNF- α inhibitors,
235 particularly infliximab, may have a beneficial effect on calcinosis cutis in juvenile DM, but
236 their use should be carefully scrutinized in SSc because of reports of severe exacerbation of
237 pulmonary fibrosis associated with their use.⁵⁹

238 Bisphosphonates remain a therapeutic option mostly in DM, with at least partial response
239 noted in 4 studies.^{28,39-41} Nevertheless, a lack of substantive data precludes recommending a
240 specific regimen of bisphosphonates.

241 Intravenous sodium thiosulfate seemed ineffective,⁴⁹ but intralesional treatment could be a
242 promising alternative.⁵¹

243 Several other treatments, such as intravenous immunoglobulin,⁴² minocycline,^{28,52}
244 colchicine,^{28,29} and cyclophosphamide⁵³, improved calcinosis cutis in small case series but
245 with limited level of evidence.

246 Surgery and physical therapies should be considered in calcinosis cutis, both in DM and SSc:
247 several studies^{28,47} reported response rates higher than 80%. However, the surgical
248 management of digital calcinosis cutis in SSc may lead to skin necrosis and limited range of

249 motion.⁶⁰ Less invasive procedures such as carbon dioxide laser⁴³ or extracorporeal shock-
250 wave therapy^{44,45} may be useful, but the level of evidence is weak.

251 Among the limitations of this systematic review is a possible publication bias. Given the
252 rarity of publications related to calcinosis cutis treatment, we included case series with at
253 least 3 patients which may have affected our results. However, single case reports were
254 excluded, as were case series of only 2 patients, in order to reduce the bias, as previously
255 described in systematic reviews of rare diseases.⁶¹ Moreover, increasing the minimum
256 number of patients to be considered for inclusion would have led to the exclusion of several
257 treatments with high potential interest. Another limitation is the low levels of evidence of the
258 reviewed studies. To date, only 2 small RCTs assessing improvement of calcinosis cutis have
259 been performed,^{20,30} including one with calcinosis cutis as the secondary outcome,³⁰ Other
260 studies were mainly low-quality cohort studies or case series with Level IV
261 recommendations.²⁵ The severity and the size and duration of calcinosis cutis disease are
262 important confounding factors that may affect the therapeutic response. Only calcinosis cutis
263 duration was reported in some studies, and data were inadequate to perform any subgroup
264 analyses.

265 The treatment of calcinosis cutis is a major unmet need. Identifying patients at high risk of
266 developing calcinosis cutis and its early treatment is recommended.¹⁹ On the basis of 30
267 studies including 288 SSc and DM patients, this systematic review provides evidence-based
268 guidance for practitioners.

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273 **Abbreviation and acronym list:**

274 Dermatomyositis: DM

275 Systemic sclerosis: SSc

276 Randomized controlled trial: RCT

277 Tumor necrosis factor: TNF

278 Sodium thiosulfate: STS

279

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449 **Figure Legends:**

450 **Figure 1. Flow-charts for study selection.** DM dermatomyositis, SSc: systemic sclerosis

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452 **Table 1. Characteristics of included studies evaluating the effect of warfarin and diltiazem on calcinosis cutis improvement**

Name/year	Disease (N)	Study design	Calcinosis duration at inclusion, years	Dose regimen	Partial response, N (%)	Complete response, N (%)	Follow-up, mean (range), months	Level of evidence, grade*
Warfarin								
<i>Adults</i>								
Berger, 1987	SSc (2)	RCT	8 (6-10)	1 mg/day	0 (0%)	0 (0%)	18	IB
Lassoued, 1988	SSc (1) DM (5)	R	10 (2-25)	1 mg/day	0 (0%)	0 (0%)	14.6 (7-28)	IV
Cukierman, 2004	SSc (3)	R	0.4	1 mg/day	2 (66%)	2 (66%)	20 (12-24)	IV
Balin, 2012	NA (3)	R	NA	NA	2(66%)	0 (0%)	104 (1-696)	IV
Fredi, 2015	DM (2)	R	NA	NA	0 (0%)	0 (0%)	201.8	IV
<i>Children</i>								
Berger, 1987	DM/SSc (1) DM (2)	RCT	5.3 (3-9)	1 mg/day	0 (0%)	0 (0%)	18	IB
Diltiazem								
<i>Adults</i>								
Vayssairat, 1998	SSc (12)	R	11.5	60mg x3/day	3 (25 %)	0 (0%)	78 (12-180)	IV
Balin, 2012	NA (14)	R	NA	≤480 mg/day	9 (64%)	0 (0%)	104	IV
Fredi, 2015	DM (12)	R	NA	NA	0 (0%)	0 (0%)	201.8	IV

453 RCT: randomized controlled trial, R: retrospective, SSc: systemic sclerosis, DM: dermatomyositis, NA: not available *according to modified Oxford Centre
454 for Evidence-Based Medicine Levels of Evidence and Grades of Recommendation

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464 **Table 2. Characteristics of included studies evaluating the effect of rituximab on calcinosis cutis improvement**

Name/year	Disease (N)	Study design	Dose regimen	Partial response, N (%)	Complete response, N (%)	Follow-up, mean (range), months	Level of evidence, grade*
Adult							
Aggarwal, 2016 ³⁰	DM (7)	RCT	0.575-1g/m2 at weeks 0/1	NA	1 (14%)	1.46	IB
Moazedi-fuerst, 2015 ³¹	SSc (3)	P	500 mg/m2 at weeks 0/2 then every3 months	3 (100%)	3(100%)	NA (12-24)	IV
Narvaez, 2014 ³²	SSc (9)	P	NA	9 (100%)	NA	NA	IV
Giuggioli, 2015 ³³	SSc (6)	P	375 mg/m2 at weeks 0/1/2/3	3 (50%)	0 (0%)	30 (18-48)	IV
Fredi, 2015 ²⁹	DM (2)	R	NA	1 (50)	0 (0%)	201.8	IV
Children							
Aggarwal, 2016 ³⁰	DM (22)	RCT	0.575-1g/m2 at weeks 0/1	NA	1 (4%)	1.46	IB
Bader-Meunier, 2011 ³⁴	DM (6)	R	2x500mg/m2 (n=3) 4x375 mg/m2 (n=3)	0 (0%)	0 (0%)	NA (20.2-36)	IV
Alhemairi, 2017 ³⁵	DM (4)	R	NA	4 (100%)	1 (25%)	NA (36-60)	IV

465 DM: dermatomyositis, SSc: systemic sclerosis RCT: randomized controlled trial, P: prospective, R: retrospective, NA: not available

466 *according to modified Oxford Centre for Evidence-Based Medicine Levels of Evidence and Grades of Recommendation

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471 **Table 3. Characteristics of included studies evaluating the effect of bisphosphonates, surgery and physical therapies on calcinosis cutis improvement**

Name/year	Disease (N)	Study design	Drug	Dose regimen	Partial response, N (%)	Complete response, N (%)	Follow-up, mean (range), months	Level of evidence, grade*
Biphosphonates								
<i>Adult</i>								
Balin, 2012 ²⁸	NA (2)	R	Etidronate	NA	1 (50%)	0 (0%)	NA	IV
Children								
Marco Puche, 2009 ³⁹	DM (3)	R	Pamidronate	IV 1mg/kg/day at day 1, 2, 3 every 3 months	3 (100%)	1 (33%)	42	IV
Tayfur, 2015 ⁴⁰	DM (3)	R	Pamidronate	IV 1mg/kg/day every 3 months	2 (66%)	1 (33%)	84	IV
	DM (1)	R	Risedronate	PO 1.25 mg/day	1 (100%)	1 (100%)	84	IV
	DM (2)	R	Alendronate	PO 70mg/week	0 (0%)	0 (0%)	84	IV
Saini, 2016 ⁴¹	DM (6)	R	Alendronate	NA	4 (66%)	0 (0%)	22.32 (4.9-27.7)	IV
Surgery and physical therapies								
<i>Adult</i>								
Bottomley, 1996	SSc (6)	P	Carbon dioxide laser	Range of power between 7-5 and 10 W	5 (83%)	NS	> 6	IV
Balin, 2012	NA (28)	R	Surgical excision		27 (96%)	22 (79%)	104	IV
	NA (1)	R	Low frequency ultrasound	NS	1 (100%)	0 (0%)	NA	IV
Blumhardt, 2016	SSc (4)	P	ESWT	1 day/week 3 weeks	4 (100%)	0 (0%)	3	IV
Sultant-Bichat, 2012	DM (1) SSc (2)	P	ESWT	1 day/3 weeks, 3 times	1 (33%)	0 (0%)	8	IV
Shetty, 2005	SSc (3)	P	Iontophoresis of acetic acid + ultrasound	3 d/ week, 3 weeks	0 (0%)	0 (0%)	0.75	IIB
Fahmy, 1998	SSc (15)**	P	Surgical excision (microdrilling)		12 (80%)	NA	0.1	IV

472 R: retrospective, IV: intravenously, PO: Per mouth, NA: not available, DM: dermatomyositis, SSc: systemic sclerosis; ESWT: extracorporeal shock-wave therapy;
473 *according to modified Oxford Centre for Evidence-Based Medicine Levels of Evidence and Grades of Recommendation. **Improvement in 12/15 digits in 10 treated
474 patients.

475 **Table 4. Summary of available treatments for treating calcinosis cutis in DM and SSc**
 476 **patients**

Drug/therapeutic class ^{ref}	Number of DM/SSc patients treated	Overall response rate (%)	Comments ^{ref} (level of evidence)	Grade of recommendation
Warfarin ^{20,26-29}	6/10 (NA=3)	0-66%	Should not be recommended (IB)	B
Diltiazem ^{10,28,29}	12/12 (NA=14)	0-64%	-May have a preventive effect ¹² -Should be discussed in SSc patients and DM with Raynaud's phenomenon (IV)	C
Infliximab ^{29,36,38}	20/0	0-80%	May be discussed in DM patients (IV)	C
Abatacept ³⁷	4/0	100%	May be discussed in DM patients (IV)	C
Rituximab ²⁹⁻³⁵	41/18	0-100%	May be discussed in DM and SSc patients	C
Biphosphonates ^{28,39-41}	15/0 (NA=2)	0-100%	May be discussed in DM patients (IV)	C
Intravenous immunoglobulins ^{29,42}	15/0	0-62%	May be discussed in DM patients (IV)	C
Minocyclin ^{28,52}	0/9 (NA=3)	33-88%	May be discussed in SSc patients (IV)	C
Colchicine ^{28,29}	(NA=16)	11-43%	May be discussed in DM and SSc patients (IV)	C
Cyclophosphamide ⁵³	14/0	69%	May be discussed in DM patients (IV)	C
Intravenous sodium thiosulfate ^{48,49}	4/3	0%	Should not be recommended (IV)	C
Topical* or intralesional sodium thiosulfate ^{29,50,51}	7/6	0-100%	May be discussed in DM and SSc patients (IV)	C
Surgical excision and physical therapies ^{28,47}	0/15 (NA=28)	80-96%	-May be discussed in DM and SSc patients (IV) -Carbon dioxide laser ⁴³ , low frequency ultrasound ²⁸ and ESWT ^{44,45} may be alternative treatments to surgery (IV) -Iontophoresis of acetic acid + ultrasound ⁴⁶ seems ineffective (IIB)	C C C

477 DM: dermatomyositis; SSc: systemic sclerosis; NA: DM or SSc patients but unspecified
 478 diagnosis; * including sodium metabisulfite

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3032 citations retrieved
from Pubmed, Embase, Cochrane,
& hand search

2723 excluded papers
1435 no calcinosis/calcinosis treatment
531 case report or ≤ 2 patients
509 year of publication <1980
151 reviews/guidelines
95 no DM/SSc
2 in vitro studies

309 papers
undergoing full-text revision

278 papers excluded after full-text review
123 case report or ≤ 2 patients
66 no calcinosis/calcinosis treatment
64 reviews/guidelines
24 duplicated papers
3 no DM/SSc

30 papers
included in the meta-analysis

