

Systematic Review of Distal End Radius Fracture Treatment

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Abstract

Fractures of the distal radius are extremely common injuries and the outcome differs depending on the type of fracture. Normally stable distal radius fracture is treated non-operatively with a favorable result. In the other hand, unstable fracture easily becomes malunited with inadequate treatment. Those point of the consider might have been to give acceptable a precise written works survey around the present surgical administration about distal span fractures. We searched medline by means of PubMed, SCOPUS, Web about Science, Cochrane focal register from claiming regulated Trials (CENTRAL), Also Google researcher starting with their origin till november 2019. The quest retrieved 2089 exceptional records. We after that retained 57 conceivably qualified records for full-texts screening. Finally, 29 investigations were included. There may be no agreement in regards the suitable medicine for distal span fractures, variables that influence nature from claiming an aggregation Throughout recuperation for example, pain, the rate about recovery, constraint for ADLs, Also possibility difficulties will be All the more discriminating On choosing the medication methodology. Personal satisfaction for life relies ahead individuals' activities, lifestyles What's more preferences, as opposed period. The utilization from claiming inward obsession will be on the rise, yet there bring been no extensive scale randomized regulated trials on analyze VLPS should other medicines. In spite of the fact that there will be exactly proof that results of VLPS would Concerning illustration beneficial to elderly patients Similarly as the individuals to junior patients, there may be no verification that these results defend this more invasive, What's more inclined more expensive, system. By further extensive scale investigations are even now required on affirm our discoveries.

Keywords: Distal End, Radius Fracture, Internal plate fixation.

1. Introduction

Distal span fractures need aid a standout amongst the The greater part regular happening in the united States, second just on hip fractures done elderly, for an evaluated frequency for 643,000 for every year. This carries an expansive monetary load in the elderly alone, with a evaluated medicare framework consumption of \$385 will \$535 million dollars yearly. Medicine of distal span fractures verifiably need been predominantly Eventually Tom's perusing modest methods including throwing alternately constrained percutaneous obsession. Taking after the discharge of the volar locking plate in the early 2000s, and promptly reports for triumph with inner fixation, Notoriety need consistently expanded for medication for distal span fractures done more youthful populaces [1].

Various investigations have exhibited great results accompanying inner plate fixation, yet prospective randomized controlled trials would restricted to amount Also contemplate plan. "around those elderly, rates of internal obsession expanded starting with 3% to 1997 to 16% for over 2,800 doctor look assignments led from April 1, 2009 to March 31, 2010. Other investigations need exhibited increments of 39% starting with 1999 with 2007. Provided for those helter skelter rate from claiming distal span fractures in the elderly, and the higher cosset about inner fixation, this need profound financial suggestions. Investigations of medicare uses to medicine of distal span fractures discovered that \$170 million On medicare trusts were went through clinched alongside 2007, what added up to 32% about which were to internal obsession. If doctor inclination proceeds will take after progressive patterns to internal fixation, this intimates vast expands to medicare consumption [2].

Previously, addition, you quit offering on that one must additionally think as of those hidatsa costs, for

example, such that passing for productivity, as a result these wounds Normal any rate as 1 alternately a greater amount day away from work worth of effort with see An physician, radiographic/routine follow-up, What's more endorsed days of confined movement in any case for medicine sort. Late american Academy of orthopedic Surgeons (AAOS) rules propose weekly radiographic observation for 3 weeks Emulating diminishment and during discontinuance from claiming immobilization. Rates about give back will worth of effort accompanying distal span fractures have been found on make profoundly variable and the individuals who need helter skelter self-reported pain/disability In benchmark would at hazard to prolonged passing from claiming worth of effort days. 16 Despite the most astounding rate (351. 5 for every 100,000) about distal span fractures incurred yearly are in the 75 should 84 quite a while agdistis range, there need aid even now significant rates incurred inside the attempting populace [3].

For 2009, AAOS discharged rules to distal span fractures. However, there at present exist huge geographic varieties On inclination for internal obsession through customary shut medication routines (ranging from 4. 6% on 42. 1% for open decrease internal obsession [ORIF]). Those absence of prospective level i or ii investigations abandons medication choices generally In view of particular survey and clinician experience. Koval Furthermore partners found that hand-fellowship surgeons were essentially less averse to treat for interior obsession over nonfellowship-trained surgeons. Present patterns to ORIF need aid thought with be identified with surgeon's conviction that ORIF Furthermore bolted volar plating are connected with bring down muddling rates, exceptional function, and superior fulfillment over percutaneous or outside fixation; however, these have not been totally substantiated in the written works. It is by acknowledged

that ORIF gives additional stable fixation and facilitates prior extension about movement yet the clinical essentialness for this need not been turned out [4].

Provided for the shared characteristic of the distal radius fracture, What's more astonishing inconsistencies done medication practices, this demonstrates the compelling reason for a finer understanding about present medication methods, outcomes, and the require to All the more prospective randomized regulated trials [5].

Those point of the contemplate might have been to provide a deliberate written works Audit something like the current surgical management from claiming distal radius fractures.

2. Materials and methods

We performed this systematic review and meta-analysis in accordance to the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement and Meta-analysis Of Observational Studies in Epidemiology (MOOSE) statement. PRISMA and MOOSE are reporting checklists for Authors, Editors, and Reviewers of Meta-analyses of interventional and observational studies. According to International committee of medical journal association (ICJME), reviewers must report their findings according to each of the items listed in those checklists [1].

Study Selection and Eligibility Criteria

- Studies that included adults' patients with fractures of distal end of radius
- Studies that assessed the effectiveness and safety of the five common techniques: volar locking plate system (VLPS), non-bridging external fixation (non-BrEF), bridging external fixation (BrEF), percutaneous Kirschner-wire fixation (PKF), and cast immobilization (CI)
- Studies that compared those techniques with each other or with no comparison
- Studies that reported any of the following outcomes: wrist arc of motion, grip strength, DASH score, Volar tilt and ulnar variance, activities of daily living (ADLs), and complications.

We excluded studies with (1) fewer than 10 patients, (2) no information provided about the number of patients lost to follow-up, (3) complications not reported, (4)

studies including a surgical technique that combined the use of an external fixator and plate fixation in the same patient, (5) studies including non-standard procedures such as functional casting or intramedullary wire fixation, or (6) studies of fractures associated with either fractures of the distal ulna (not including isolated fractures of the styloid process), fractures of carpal bones, dislocation of the distal radioulnar joint, fractures with vascular injury, or open fractures.

Data extraction

Data entry and processing were carried out using a standardized Excel sheet and reviewers extracted the data from the included studies. The extracted data included the following domains: (1) Summary characteristics of the included studies; (2) Baseline characteristics of studied populations; and (3) Study outcomes. All reviewers' independently extracted data from the included articles and any discrepancies were solved by discussion.

Dealing with missing data

Missing standard deviation (SD) of mean change from baseline was calculated from standard error or 95% confidence interval (CI) according to Altman [6].

Data synthesis

Continuous outcomes were pooled as mean difference (MD) or standardized mean difference (SMD) using inverse variance method, and dichotomous outcomes will be pooled as relative risk (RR) using Mantel-Haenszel method. The random-effects method was used under the assumption of existing significant clinical and methodological heterogeneity. We performed all statistical analyses using Review Manager (RevMan) 5.3 or Open Meta-analyst for windows.

3. Results

In the present study, we searched Medline via PubMed, SCOPUS, Web of Science, Cochrane Central Register of Controlled Trials (CENTRAL), and Google Scholar from their inception till November 2019. The search retrieved 2089 unique records. We then retained 57 potentially eligible records for full-texts screening. Finally, 29 studies were included Fig (1).

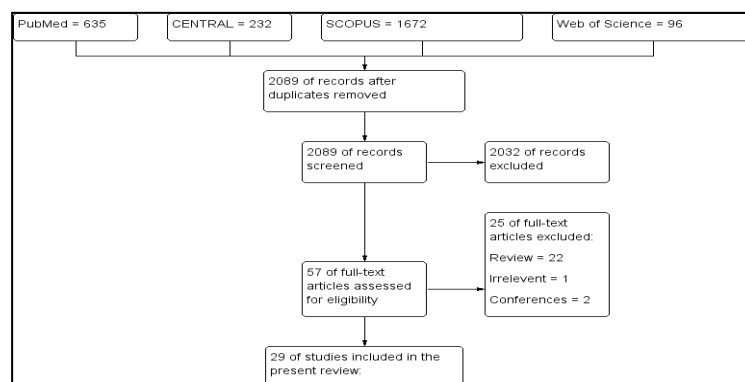


Fig (1) PRISMA flow-chart

Volar locking plating system, Tables (1-3)

Table (1) Summary Characteristics of the included studies.

First Author	Year	Procedure	N	Study design	Level of Evidence	SEQES [^] Score (0–48)	Institutional setting	Surgeons
Chung	2008	VLPS	25	PCS	II	34	Single site	Single
Gerald	2008	VLPS	55	PCS	II	24	Single site	Single
Lattmann	2009	VLPS	91	PCS	II	34	Single site	Unknown
Arora	2009	VLPS, CI	114	Case series	IV	28	Single site	Multiple
Drobetz	2003	VLPS	50	Case series	IV	13	Single site	Unknown
Orbay	2004	VLPS	24	Case series	IV	21	Multicenter	Multiple

Table (2) Baseline characteristics of the included studies.

First Author	No. of Patients	No. of Fractures	Female (%)	Intraarticular Fracture (%)	Mean Age (yr)	Mean Follow-Up (mo)	Period of Wrist Immobilization	Type of Supplemental Wrist Immobilization
Arora	53	53	36(68%)	25 (47%)	76	52	2wks	Splint
Chung	25	25	19(76%)	12 (48%)	69	12	6wks	Splint
Drobetz	49	50	40(82%)	34 (68%)	62	26	2wks*	Splint*
Gerald	55	55	37(67%)	55 (100%)	60	29	4wks	Cast
Lattmann	91	91	73(80%)	57 (63%)	64	12	1–4wks	Cast
Orbay	23	24	17(74%)	8 (33%)	79	15	-	-
Total	296	298	222(75%)	191 (64%)	67	25	-	-

Table (3) Final Number of Patients and Fracture, and Result of Scoring System.

Procedure	First Author	No. of Patients at final follow-up	No. of Fractures at final follow-up	Scoring system (name: % of patients receiving excellent and good scores or mean points scored)
VLPS	Arora	53	53	Green and O'Brien: 74%; DASH: 11.1/100*; PRWE: 9.3/100*
	Chung	17	17	MHQ: 85/100
	Drobetz	49	50	Cooney: 68%; Sarmiento: 92%
	Gerald	55	55	Gartland and Werley: 80%; DASH: 7.1/100*
	Lattmann	86	86	
	Orbay	23	24	DASH: 8.2/100*

Non-bridging external fixation, Tables (4-6).

Table (2) Summary Characteristics of the included studies.

First Author	Year	Procedure*	N	Study design	Level of Evidence	SEQES [^] Score (0–48)	Institutional setting	Surgeons
Atrosh	2006	Non-BrEF, BrEF	38	RCT	I	38	Single site	Unknown
Krukhaug	2009	Non-BrEF, BrEF	75	RCT	I	41	Multicenter	Multiple
McQueen	1998	Non-BrEF, BrEF	60	RCT	I	39	Single site	Single

Table (3) Baseline characteristics of the included studies.

Procedure	First Author	No. of Patients	No. of Fractures	Female (%)	Intraarticular Fracture (%)	Mean Age (yr)	Mean Follow-Up (mo)	Period of Wrist Immobilization
Non-BrEF	Atroshi	18	18	16(89%)	8 (44%)	70	12	6wks
	Krukhaug	35	35	-	0	62	12	6wks
	McQueen	28	30	27(96%)	9 (30%)	62	12	6wks

Table (4) Final Number of Patients and Fracture, and Result of Scoring System.

Procedure	First Author	No. of Patients at final follow-up	No. of Fractures at final follow-up	Scoring system (name: % of patients receiving excellent and good scores or mean points scored)
Non-BrEF	Atrosh	18	18	DASH: 11/100 [*] ; SF-12: 49/100
	Krukhaug	35	35	DASH: 9/100 [*]
	McQueen	28	28	

Bridging external fixation, Tables (7-9).**Table (5)** Summary Characteristics of the included studies.

First Author	Year	Procedure [*]	N	Study design	Level of Evidence	SEQES [^] Score (0-48)	Institutional setting	Surgeons
McQueen	1996	BrEF, CI	90	RCT	I	37	Single site	Multiple
Schmalholz	1990	BrEF	25	RCT	I	30	Single site	Single
Pritchett	1995	BrEF	50	RCT	II	21	Single site	Single
Cannegieter	1997	BrEF	32	Case series	IV	15	Single site	Unknown
Hegeman	2005	BrEF	16	Case series	IV	17	Single site	Unknown
Ziran	2000	BrEF	10	Case series	IV	14	Single site	Single

Table (6) Baseline characteristics of the included studies.

Procedure	First Author	No. of Patients	No. of Fractures	Female (%)	Intraarticular Fracture (%)	Mean Age (yr)	Mean Follow-Up (mo)	Period of Wrist Immobilization
BrEF	Atroshi	18	19	15 (83%)	11 (58%)	71	12	6wks
	Cannegieter	32	32	27 (84%)	19 (59%)	68	36	5wks
	Hegeman	16	16	16(100%)	16 (100%)	67	48	6wks
	Krukhaug	37	37	-	0	62	12	6wks
	McQueen	28	30	28(100%)	5 (17%)	61	12	6wks
	McQueen	28	30	25 (89%)	16 (53%)	63	12	5wks
	Pritchett	50	50	26 (52%)	50 (100%)	65	24	6wks
	Schmalholz	25	25	24 (96%)	0	66	12	5wks
	Ziran	10	10	-	10 (100%)	62	29	8wks
	Total		244	249	-	127 (51%)	65	20

Table (7) Final Number of Patients and Fracture, and Result of Scoring System.

Procedure	First Author	No. of Patients at final follow-up	No. of Fractures at final follow-up	Scoring system (name: % of patients receiving excellent and good scores or mean points scored)
BrEF	Atroshi	18	18	DASH: 7/100 [*] ; SF-12: 48/100
	Cannegieter	32	32	Sarmiento: 100%
	Hegeman	16	16	Gartland and Werley: 63%
	Krukhaug	37	37	DASH: 13/100 [*]
	McQueen	28	28	
	McQueen	28	28	

Table (9) Continue

Pritchett	50	50	Lindstrom: 84%
Schmalholz	25	25	Lindstrom: 84%
Ziran	10	10	PRWE: pain - 11/100*, disability - 9.8/100*

Percutaneous Kirschner-wire fixation, Tables (10-12).**Table (8) Summary Characteristics of the included studies.**

First Author	Year	Procedure*	N	Study design	Level of Evidence	SEQES [^] Score (0-48)	Institutional setting	Surgeons
Fujii	2002	PKF	22	Case series	IV	17	Single site	Unknown
Hede	2000	PKF	42	Case series	IV	17	Single site	Unknown
Shiota	2003	PKF	37	Case series	IV	18	Single site	Unknown
van Aaken	2008	PKF	34	Case series	IV	21	Unknown	Unknown

Table (9) Baseline characteristics of the included studies.

Procedure	First Author	No. of Patients	No. of Fractures	Female (%)	Intraarticular Fracture (%)	Mean Age (yr)	Mean Follow-Up (mo)	Period of Wrist Immobilization	Type of Supplemental Wrist Immobilization
PKF	Azzopardi	27	27	23 (85%)	0	72	12	unknown	Cast
	Fujii	22	22	21(95%)	14(64%)	69	24	5wks	Unknown
	Hede	42	43	31(74%)	0	61	33	5wks	Splint
	van Aaken	34	34	26 (76%)	19 (56%)	63	30	6wks	Splint
	Shiota	37	37	11 (30%)	15 (41%)	66	28	3wks	Splint
	Total	162	163	112(69%)	48 (29%)	66	25	-	-

Table (10) Final Number of Patients and Fracture, and Result of Scoring System.

Procedure	First Author	No. of Patients at final follow-up	No. of Fractures at final follow-up	Scoring system (name: % of patients receiving excellent and good scores or mean points scored)
PKF	Azzopardi	27	27	Sheehan's ADL: unilateral - 7.6/8, bilateral - 9.7/12
	Fujii	22	22	Saito: 91%
	Hede	42	43	Luca: 93%
	Shiota	37	37	
	van Aaken	25	25	Gartland and Werley: 85%

Cast immobilization, Table (13-15)**Table (11) Summary Characteristics of the included studies.**

First Author	Year	Procedure*	N	Study design	Level of Evidence	SEQES [^] Score (0-48)	Institutional setting	Surgeons
Sanchez-Sotelo	2000	CI	55	RCT	I	31	Single site	Single
Young	2003	CI	25	Caseseries	IV	18	Multicenter	Multiple

Table (12) Baseline characteristics of the included studies.

Procedure	First Author	No. of Patients	No. of Fractures	Female (%)	Intraarticular Fracture (%)	Mean Age (yr)	Mean Follow-Up (mo)	Period of Wrist Immobilization
CI	Arora	61	61	42(69%)	30 (49%)	81	62	6wk
	Azzopardi	27	27	25(93%)	0	71	12	5wk
	McQueen	30	30	28(93%)	19 (63%)	64	12	6wk
	Sanchez-Sotelo	55	55	49(89%)	20 (36%)	67	12	6wk

Table (14) Continue

Young	66	66	58(89%)	9 (14%)	60	84	6wk
Total	239	239	203(85%)	78 (33%)	69	45	-

Table (13) Final Number of Patients and Fracture, and Result of Scoring System.

Procedure	First Author	No. of Patients at final follow-up	No. of Fractures at final follow-up	Scoring system (name: % of patients receiving excellent and good scores or mean points scored)
CI	Arora	61	61	Green and O'Brien: 85%; DASH: 11.6/100*; PRWE: 16.9/100*
	Azzopardi	27	27	Sheehan's ADL: unilateral – 7.4/8, bilateral - 9.4/12
	McQueen	28	28	
	Sanchez-Sotelo	55	55	Cooney: 55%
	Young	49	49	Gartland and Werley: 96%

Closed Reduction, Tables (16-17).

Table (14) Summary Characteristics of the included studies.

	Country	n (FTT)	Median age (range)	Sex (female %)	Inclusion period
Earnshaw et al	UK	223 (112)	65 (15–92)	77	Aug 1997–Oct 1998
Holkenborg et al	Netherlands	144 (66)	66 (N/A)	92	Jun 2008–Jul 2011
Kongsholm et al	Sweden	116 (62)	62 (19–86)	91	N/A

Table (15) Study results.

		Presentation		Post-reduction		Pain	Success rate (%)
		Dorsal tilt (dgr)	Shortening (mm)	Dorsal tilt (dgr)	Shortening (mm)		
Earnshaw et al ¹⁴	Finger-trap traction	23.6 +/- 12.0	5.5 +/- 3.9	-2.5 +/- 2.0	1.9 +/- 1.0	-	87.0
	Manual traction	24.4 +/- 10.8	7.0 +/- 5.5	-3.6 +/- 2.2	2.0 +/- 1.0	-	87.0
Holkenborg et al ⁷	Finger-trap traction	27.4 +/- 12.0	3.8 +/- 3.9	5.3 +/- 9.3	0.2 +/- 2.8	44	71.2
	Manual traction	28.7 +/- 11.6	5.3 +/- 3.6	2.7 +/- 9.6	0.8 +/- 2.9	53	80.5
Kongsholm et al ⁸	Finger-trap traction	21.8 +/- 12.8	6.6 +/- 4.4	-0.2 +/- 4.3	1.3 +/- 2.5	Less	-
	Manual traction	19.4 +/- 12.3	6.5 +/- 4.0	-1.9 +/- 3.8	2.0 +/- 2.4	More	-

Functional Outcomes, Tables (18-19).

Table (16) Active Arc of Motion of the Wrist and Forearm at Final Follow-up (Weighted Mean).

	VLPS (n=218)	Non-BrEF (n=18)	BrEF (n=28)	PKF (n=68)	CI (n=137)	p value
Wrist flexion/extension arc (degrees)	118	118	116	112	130	0.68 ^a
Forearm rotation arc (degrees)	168	168	153	140	175	0.15 ^a

Table (17) Grip Strength at Final Follow-up (Weighted Mean)

Grip strength (% compared with contralateral)	VLPS (n=235)	Non-BrEF (n=28)	BrEF (n=138)	PKF (n=95)	CI (n=220)	p value
Primary literature review	81	69	84	74	85	0.707
Secondary literature review	76	-	-	83	84	<0.001

Radiographic Outcome, Table (20).**Table (18)** Radiographic Parameters at Final Follow-up (Weighted Mean).

		VLPS	Non-BrEF	BrEF	PKF	CI	p value
Volar Tilt (degrees)	Primary literature review	3.9 (n=235)	6.5 (n=81)	-0.8 (n=169)	3.7 (n=52)	-11 (n=220)	0.018
	Secondary literature review	3.1 (n=94)	-	0.3 (n=35)	0.5 (n=49)	-11 (n=168)	<0.001
Radial Inclination (degrees)	Primary literature review	13.4 (n=149)	13.7 (n=53)	13.9 (n=113)	21 (n=52)	14.8 (n=137)	0.182
	Secondary literature review	22.8 (n=94)	-	19.5 (n=35)	21 (n=49)	18.0 (n=168)	<0.001
Ulnar Variance (mm)	Primary literature review	1.5 (n=53)	1.0 (n=53)	1.1 (n=81)	3.0 (n=27)	3.6 (n=143)	<0.001
	Secondary literature review	1.5 (n=53)	-	2.4 (n=35)	3.0 (n=49)	3.6 (n=143)	<0.001

Complications, Table (21).**Table (19)** Summary of Complications.

	Type	VLPS	Non-BrEF	BrEF	PKF	CI	p value
Minor	Superficial infection	0	25	39	2	0	<0.001
	Others	2	0	0	9	0	
	Total (%)	2 (1%)	25 (31%)	39 (16%)	11(8%)	0	
Major not requiring Surgery	Nerve lesion	6	1	10	4	4	<0.001
	CRPS	9	0	16	2	11	
	Early hardware removal	0	0	6	3	0	
	Others	3	0	2	0	0	
	Total (%)	18 (6%)	1 (1%)	34(14%)	9 (7%)	15 (7%)	
Major requiring Surgery	Tendon rupture/adhesion	18	2	0	3	3	<0.001
	Nerve lesion	2	0	2	0	0	
	Infection	2	0	1	0	0	
	Hardware loosening, failure or removal	8	0	0	0	0	
	Others	2	0	2	0	0	
	Total (%)	32 (11%)	2 (3%)	5 (2%)	3 (2%)	3 (1%)	

4. Discussion

Distal span fractures (DRFs) might make the practically normal kind for wrist fractures, Furthermore a bimodal conveyance is seen with a crest frequency to persons 18–25 A long time of age Also second top done persons more seasoned over 65 quite some time. Higher-energy damages would additional normal On more youthful patients who need secondary utilitarian requests Also low-energy wounds are All the more normal in the elderly who are at hazard of osteoporosis. Same time DRFs would the second practically normal crack kind in

the elderly populace Furthermore An sourball of morbidity/mortality and misfortune from claiming nature

about life, those ideal administration will be even now dubious.

An assortment from claiming surgical and nonsurgical choices would accessible for treating DRFs including shut decrease Furthermore plaster casting, Kirschner-wire stabilization, outer fixation, Furthermore open diminishment Also inside obsession (ORIF) with volar bolted plating. Same time there is a pattern towards preservationist administration from claiming DRFs in the elderly and plaster throwing will be common, later

Cochrane precise reviews finished up that there might have been insufficient confirmation with focus on with perform surgery, the thing that sort for surgery may be best, Furthermore the thing that nonsurgical medicine will be best to those medication of DRFs.

Notwithstanding heterogeneity Around studies, outside obsession and Kirschner-wire adjustment show up should a chance to be connected with higher rates about spoiling. Stratifying elderly patients under low-demand What's more high-demand gatherings might move forward the surgical management about DRFs. Previously, inactive patients with low demands, practical results need aid beneficial Regardless of the vicinity of a deformity, while patients for higher requests might profit from crack adjustment with locking volar plates. Volar plating for fixed-angle screws might be that's only the tip of the iceberg suitability to slow-healing elderly patients who would that's

only the tip of the iceberg powerless with pin-track spoiling Also sooner tendon aggravation prompting break.

Similarly as the ideal oversight economy of DRFs in the elderly may be uncertain, the reason for this examine might have been to perform a precise Audit and meta-analysis thinking about the conclusions of surgical What's more nonsurgical administration of DRFs over elderly patients.

5. Conclusion

There will be no agreement in regards the fitting medication to distal span fractures. Consequently, signs to surgical intercession are judged separately dependent upon the parity about hazard and profit. In there may be no incredible Contrast the middle of practical results What's more ADL you quit offering on that one quite a while then afterward injury, factors that influence personal satisfaction of life Throughout recuperation for example, such that pain, the rate about recovery, constraint from claiming ADLs, Also possibility difficulties will a chance to be All the more incredulous Previously, choosing the medication technique. Nature from claiming term relies once individuals' activities, lifestyles and preferences, as

opposed agdistis. The utilization for inside obsession is on the rise, yet there have been no extensive scale randomized controlled trials should analyze VLPS should other medicines. Despite there will be some proof that results for VLPS need aid Similarly as useful clinched alongside elderly patients Likewise the individuals clinched alongside adolescent patients, there is no verification that these conclusions defend this more invasive, Furthermore liable a greater amount expensive, technique. By further vast scale investigations would still necessary should affirm our discoveries.

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