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Clinical Impact of Continuous Renal Replacement Therapy on Multiple Organ Failure

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Abstract. Because continuous renal replacement therapy (CRRT) may enhance inflammatory mediator removal, this review assesses its impact on multiple organ failure (MOF). Regarding MOF with acute renal failure (ARF), the overall mortality of 2313 CRRT patients (43 studies) was 62.8% compared with 59.1% ($p = 0.046$) in 961 intermittent hemodialysis (IHD) patients (12 other studies). Of 13 CRRT studies with an IHD comparison group, 3 showed that the groups had a similar risk, but IHD mortality was higher; 1 noted that CRRT had lower mortality (risk not stated); and 4 showed similar mortality and greater CRRT risk. Aggregate mortality was IHD 69.5% and CRRT 63.9% ($p = 0.02$). Of the six studies with matched groups (age and APACHE II scores), IHD mortality was higher (70.9% vs. 60.1%, $p = 0.01$). CRRT pulmonary gas exchange, hemodynamic instability, azotemia control, fluid overload, and nutritional support were better. Regarding MOF without ARF, of 14 CRRT studies (14.5 patients per study), only 4 had comparison groups. Patient conditions were as follows: acute respiratory distress syndrome, six studies; sepsis, three studies; septic shock, two studies; pancreatitis, one study; critically ill patients, one study; and cardiac surgery with respiratory failure, one study. Of the three studies with a control group, the mortality was the same. There was minimal evidence that CRRT improved pulmonary gas exchange or hemodynamic instability. For MOF patients with ARF, there is compelling evidence that CRRT provides better survival than IHD and more improvement in pulmonary gas exchange, hemodynamic instability, azotemia control, fluid overload, and nutritional support. In patients with MOF and no renal failure, there is little evidence that CRRT enhances survival, oxygenation, or perfusion. Controlled trials demonstrating a CRRT benefit are necessary before CRRT can be recommended for MOF without ARF.

Multiple organ failure (MOF) is associated with a substantial mortality rate in trauma, postoperative, septic, and medical patients [1–6]. There is a 35% to 38% mortality rate for acute renal failure (ARF) without other organ failure, but the rate increases to 72% to 79% when ARF is associated with MOF [7–9]. Inflammatory mediator release has been associated with MOF in trauma, postoperative, and septic patients [1, 3, 5, 10, 11]. More specifically, inflammatory mediator release has also been found to be elaborated in ARF patients with MOF [12–16]. There is evidence that inflammatory mediator release may be incited by intermittent hemodialysis (IHD) or continuous renal replacement therapy (CRRT) [17–19]. Additional data indicate that inflammatory mediators may be removed from patients by CRRT [19–22], whereas other investigators have found little proof that CRRT enhances inflammatory mediator clearance [17 22 23–25]. Of utmost importance is the opinion that there is no definitive relation between CRRT removal of inflammatory mediators and clinical improvement [20, 21, 23, 26].

Because CRRT theoretically improves or worsens the inflammatory mediator host response, the current literature was reviewed to evaluate the evidence that CRRT is or is not associated with clinical benefit for ARF patients with MOF. The literature was also examined to determine the influence of CRRT on MOF patients with little or no renal impairment. Each study was classified according to the strength or weakness of the methodologic approach, with data class I being the most reliable information and data class III the weakest. Data class I indicates that the study is randomized and controlled. Data class II is a retrospective study of two groups in which the data are reliable and consecutive patients have been included, or it is a prospective study. An amalgamation of the literature with a preponderance of data is also considered data class II evidence. A data class III study is usually a retrospective investigation with only one group; or if there were two patient groups, consecutive patients were not evaluated.

Impact of CRRT on Clinical Outcomes in MOF with ARF

Mortality Outcome

There were 43 studies harvested from a search of the contemporary literature that presented information regarding deaths of patients undergoing CRRT for MOF with ARF [8, 13, 14, 16, 27–65]. There were no data class I studies (randomized controlled trials), 15 (34.9%) data class II studies, and 28 (65.1%) data class III studies. There was no comparison group in 29 (67.4%) of the studies; there were two groups in 14 (32.6%) investigations. Altogether, 10 (23.3%) studies were prospective, and 33 (76.7%) were retrospective. There was a total of 2313 patients, with the average number of CRRT patients per study being 53.8 (range 9–408). There were 1453 deaths for an overall mortality of 62.8% (range 25–85%). Mortality outcome data were reviewed from a publication of critically ill patients with ARF who had undergone IHD [19]. Data were selected from the 12 studies published from 1989 to 1992. There were a total of 961 patients. The average

Table 1. Continuous renal replacement therapy studies with an intermittent hemodialysis control group; patients with acute renal failure and multiple organ failure; data class II and III studies.

Study	No.	Age (years)	All score	Mortality (%)
Bartlett [28]				
CRRT	32	57	21	72
IHD	24	56	21	88
Bellomo [30]				
CRRT	87	60	30	64
IHD	40	57	25	75
Sieberth [40]				
CRRT	96	—	—	73
IHD	163	—	—	58
Chertow [8]				
CRRT	52	—	—	83
IHD	80	—	—	61
Kierdorf [54]				
CRRT	73	—	—	78
IHD	73	—	—	93
Bellomo [55]				
CRRT	150	60	28	49
IHD	84	56	26	70
Van Bommel [56]				
CRRT	60	60	27	62
IHD	34	62	22	44
Bellomo [57]				
CRRT	46	—	—	46
IHD	58	—	—	71
Bellomo [58]				
CRRT	83	51	28	59
IHD	84	56	26	70
Kruczynski [60]				
CRRT	12	45	21	25
IHD	23	61	26	83
McDonald [61]				
CRRT	22	—	—	82
IHD	10	—	—	70
Bastien [63]				
CRRT	34	60	23	47
IHD	32	54	20	75
Paganini [65]				
CRRT	47	65	36	81
IHD	27	62	27	81

CRRT: continuous renal replacement therapy; IHD, intermittent hemodialysis.

number of IHD patients per study was 80.1 (range 10–237). There were 568 deaths for an overall mortality of 59.1% (range 0–88%). The overall mortality in the 43 studies among CRRT patients was 62.8% compared with 59.1% ($p = 0.046$) for the IHD patients from the other 12 reports.

Of the 43 CRRT studies in patients with ARF and MOF, 13 had an IHD control group and sufficient patient numbers for assessment (total 1526 CRRT and IHD patients) (Table 1) [8, 28, 30, 40, 54–58, 60, 61, 63, 65]. Data class categorization was as follows: I, no study; II, seven studies [28, 30, 56–58, 60, 63]; and III, six studies [8, 40, 54, 55, 61, 65]. The following CRRT techniques were utilized in these studies: continuous arteriovenous hemofiltration (CAVH), continuous venovenous hemofiltration (CVVH), continuous arteriovenous hemodialysis (CAVHD), continuous venovenous hemodialysis (CVVHD), hemofiltration without specification of the technique, and hemodiafiltration without specification of the technique.

Bartlett et al. demonstrated an insignificantly higher mortality for IHD patients than for CRRT (CAVH) patients [28]. The IHD group was studied during 1981–1983 and the CRRT group during 1983–1985. The ages and Acute Physiology and Chronic Health Evaluation (APACHE) II (AII) scores were similar. Bellomo et al. also found an insignificantly higher mortality in IHD patients compared with CRRT (CAVHD/CVVHD) patients [30]. Age was slightly higher in the CRRT group and the AII score significantly greater. When assessing patients with two to four organs in failure, the mortality was significantly higher among those undergoing IHD. Sieberth and Kierdorf noted a significantly higher mortality among CRRT (hemofiltration) patients than among IHD patients, but there were no age or AII score data for intergroup comparisons [40]. Chertow demonstrated a significantly higher mortality for CRRT (hemofiltration) patients than for IHD patients, but there were no age or AII score data for intergroup comparisons [8]. Patients with pressor-dependent hemodynamic instability were placed in the CRRT group, indicating that they were likely to be more critically ill than the IHD group. Kierdorf found a significantly higher mortality for IHD patients than for CRRT (CVVH) patients, but there were no age or AII score data for intergroup comparisons [54]. Bellomo et al. also described a significantly higher mortality for IHD patients than for CRRT (hemodiafiltration) patients, although the CRRT group had a significantly higher AII score [55]. Van Bommel noted an insignificantly higher mortality for the CRRT (CAVHD) patients, although the CRRT patients had a significantly higher AII score [56]. The AII score of the CRRT survivors was the same as the IHD deaths. In matched patients with two to four organ failures, Bellomo and Boyce found that the mortality was significantly higher in the IHD group than in the CRRT (CVVHD) group [57]. Bellomo et al. noted an insignificantly higher mortality in the IHD group than in the CRRT (hemodiafiltration) cohort [58]. Kruczynski et al. found significantly lower mortality in the CRRT (CAVH) patients, but they were younger than the IHD group [60]. McDonald and Mehta demonstrated an insignificantly higher mortality for CRRT (CAVHD) patients when contrasted with the IHD group, but there were no age or AII score data for intergroup comparisons [61]. Those undergoing both CRRT and IHD were excluded from this analysis. Patients in the CRRT group had significantly more hypotension, suggesting that they were more critically ill than the IHD cohort. Bastien et al. showed significantly lower mortality among CRRT (CVVHD) patients, although there was no difference in intergroup age or AII scores [63]. Paganini noted identical mortality rates for the IHD and CRRT (CAVHD) groups [65], although the CRRT AII score was significantly higher and the age was similar.

An improved outcome with CRRT is strongly suggested by the three studies in which the two groups were matched and the mortality was higher for IHD patients [55, 57, 63]. The total number of patients in these three studies was 404 (26.5% of patients in the 13 studies). CRRT survival benefit is also insinuated by one study demonstrating a lower mortality, but the ages and AII scores were not provided [54]. The total number of patients was 146 (9.6% of patients in the 13 studies).

Four other studies implied a survival advantage from CRRT where the mortality rates are similar, although the CRRT group was at greatest risk for death [30, 56, 61, 65]. The total number of patients was 327 (21.4% of patients in the 13 studies).

Only two studies reported a significantly higher mortality for the CRRT group, although there were no age or AII score data to

Table 2. Continuous renal replacement therapy studies with an intermittent hemodialysis control group; patients with acute renal failure and multiple organ failure; data class II studies.

	CRRT			IHD		
Study	No.	Age (years)	All score	No.	Age	All score
Bartlett [28]	32	57	21	24	56	21
Bellomo [30]	87	60	30	40	57	25
Van Bommel [56]	60	60	27	34	62	22
Bellomo [58]	83	51	28	84	56	26
Kruczynski [60]	12	45	21	23	61	26
Bastien [63]	34	60	23	32	54	20
Total	308	57	27	237	57	24

One study was excluded because it was a subset analysis [57].

indicate that the two groups were at similar risk in one investigation [40] and the other indicated that the CRRT group was more ill [8]. The total number of patients was 391 (25.6% of patients in the 13 studies).

In summary, 8 of the 13 studies suggested that CRRT was associated with enhanced survival. The total number of patients was 877 (57.5% of patients in the 13 studies). A survival benefit is also suggested when the mortality rates for the CRRT and IHD groups are aggregated. The 69.5% IHD group mortality (509/732) was significantly higher than that for the CRRT patients (63.9%, 507/794) ($p = 0.02$).

A reduced risk for death was also suggested when six data class II CRRT studies with an IHD control group were aggregated and evaluated (Table 2) (the seventh class II study was excluded because it was a subset analysis [57]). Aggregate mean ages and AII scores were generated by: (1) multiplying the mean age or AII score for a study group (IHD or CRRT) by the number of patients in a particular study; (2) taking the sum of the age or AII score for all IHD or CRRT patients; and (3) dividing the sum by the total patients in the CRRT or IHD aggregate group. The mean ages and AII scores for the IHD and CRRT groups were similar. The 70.9% IHD group mortality (168/237) was significantly higher than the CRRT patients' 60.1% rate (185/308) ($p = 0.01$).

Although multiple risk factors have been found to affect ARF mortality, stratification of patient risk by the AII score for the CRRT and IHD groups is supported by the literature. A number of risk factors that adversely affect survival in ARF patients have been identified: age [66–68], hemodynamic instability [7, 9, 66, 68, 69], pulmonary failure [7, 9, 66, 69], preexisting medical conditions [67, 70], sepsis [7, 67, 68, 70], oliguria [9, 66, 67, 70], jaundice [9, 66, 69], and gastrointestinal dysfunction [7]. Several investigators indicate that the presence of MOF was clearly a risk factor for death in the presence of ARF [7–9, 66, 67, 70]. Additionally, the etiology of the ARF has been found to influence outcome [35, 66, 70, 71]. All scores are a reasonable risk-stratification measure because score validity has been documented in several studies [30, 35, 67, 72]. Additionally, the score is influenced by several components that have also been cited in the literature as being associated with increased ARF mortality: age, preexisting medical conditions, temperature and white blood cell count (sepsis), blood pressure, respiratory rate and oxygenation (pulmonary failure), and creatinine (oliguria).

There is reasonable evidence to suggest that the high mortality for ARF has not decreased over the last several decades [73–75]. Some believe that this is because ARF in critically ill patients is usually associated with MOF [76], where the mortality is more dependent on the underlying disease than on renal failure per se [77–79]. Certain experts opine that CRRT probably reduces ARF mortality [73–75, 80], whereas others indicate that a clear survival advantage over IHD cannot be established [73, 75, 77–82]. Some comparisons between CRRT and IHD show that the CRRT group is often more critically ill than those undergoing IHD [78, 81]. Some think that demonstration of a similar outcome for continuous and intermittent RRT, despite a higher mortality risk in the CRRT group, indicates a survival benefit with CRRT [79]. When the mortality rate is higher in those undergoing CRRT, their severity of illness has been noted to be greater [81]. Other methodologic study flaws include small numbers of patients, heterogeneous case mix, use of both CRRT and IHD in the same patient, variable experience of care providers, changes in indications for CRRT and IHD over the past three to four decades, and little or no description of disease severity [79, 80, 82]. Randomized and other prospective, controlled studies with adequate patient numbers and matching for illness severity are needed to demonstrate a clear superiority of IHD or CRRT for ARF with MOF [74, 75, 81]. Despite the controversy over the merits of CRRT and IHD, some are of the opinion that CRRT is preferred for managing critically ill patients with ARF [75, 81, 82].

Morbidity Outcomes

The following is a review of the literature regarding the impact of CRRT on physiologic and metabolic perturbations and patient care in ARF patients with MOF. Evidence that supports the stabilization of these critically ill patients enhances the credibility that CRRT is associated with a survival benefit.

Pulmonary Gas Exchange. Improved pulmonary gas exchange (e.g., PaO_2/FiO_2) has been noted in numerous patients undergoing CRRT [27, 32, 36], whereas others have described neither improvement nor deterioration [16, 42, 44, 59]. Bellomo et al. [30] and van Bommel et al. [56] noted a superior oxygenation improvement in CRRT patients compared to that in the IHD groups. Following a review of the literature, van Bommel cited evidence for better oxygenation improvement with CRRT when contrasted with IHD [79].

Hemodynamic Instability. Patients undergoing CRRT have been found to have an amelioration of their hemodynamic instability [13, 32, 36, 39]. Many other studies have indicated that although there was no improvement in cardiovascular status with CRRT deterioration was not seen [16, 33, 37, 38, 42, 44, 47–49, 52, 53, 59, 83, 84]. When comparing patients receiving CRRT or IHD, reviewers have indicated that there was better cardiovascular stabilization in the CRRT cohort [30, 56]. Several others, after reviewing the literature, found that patients undergoing CRRT have better hemodynamic stabilization than those undergoing IHD [7477–7981].

Azotemia Control. Numerous investigators have described a substantial alleviation of azotemia following the initiation of CRRT [3132–3436, 37, 39, 42, 43, 45, 4648–5259, 85]. One researcher, however, found neither improvement nor deterioration in the degree of azotemia with CRRT [47]. When CRRT and IHD have

Table 3. Continuous renal replacement therapy studies for multiple organ failure without acute renal failure.

Study	Condition	No.	Mortality (%)	Class	Groups
Consentino [88]	ARDS	9	44	I	2
Garzia [89]	ARDS	14	64	III	1
Koperna [15]	ARDS	7	0	II	2
Gotloib [90]	ARDS	5	—	III	1
Gotloib [91]	ARDS, septic	24	8	III	1
Hoffman [92]	ARDS, septic	16	81	II	1
Gotloib [93]	Septic	35	37	III	1
Wakabayashi [94]	Septic	6	50	III	1
Hirasawa [95]	Septic	14	—	II	2
Braun [96]	Septic shock	15	33	I	2
Wiles [97]	Septic shock	2	50	III	1
Blinzler [98]	Pancreatitis	11	9	III	1
Zobel [99]	Critically ill	9	56	III	1
Coraim [100]	Cardiac surgery, respiratory failure	36	—	III	1
		203	37.8		

ARDS: acute respiratory distress syndrome.

been compared and solute elimination was evaluated, CRRT was associated with better azotemia control [3055–57]. One investigator found that CRRT was no better than IHD for decreasing the degree of azotemia [58]. Following a review of the literature, others have also observed better control of azotemia with CRRT than with IHD [77–79, 81].

Acidosis. One researcher cited evidence from two studies indicating that CRRT enhanced the resolution of acidosis [16, 44]. The same investigator noted significant alleviation of acidosis in CRRT patients compared to that in those undergoing IHD [56].

Fluid Overload. Numerous authors were persuaded that CRRT was associated with a lessening of fluid overload [28, 33, 34, 36–39, 43, 85, 86]. Other literature reviewers have also been convinced that there was an improvement in fluid balance with CRRT [79], especially when examining investigations that compared patients who underwent CRRT and IHD [77, 78].

Nutritional Support. Several studies have noted an improvement in nutritional support in individuals who underwent CRRT [28, 34, 38, 39, 47, 87]. Greater nutritional substrate amounts were provided CRRT patients compared with their conventional dialysis cohorts [55, 57, 58]. Other review articles have espoused evidence for enhanced nutritional administration in patients after initiation of CRRT [74, 81] and superior provision in CRRT patients when compared with those undergoing IHD [77–79].

Impact of CRRT on Clinical Outcomes in MOF without ARF

A total of 14 studies with 203 patients were identified where patients with MOF but little or no renal impairment had been treated with CRRT (Table 3) [1588–100]. The number of patients per study ranged from 2 to 36 (mean 14.5). The data class categorization was as follows: I, two studies (14.3%); II, three studies (21.4%); and III, nine studies (64.3%). Only four studies had a second group to compare with those receiving CRRT (28.6%) [15, 88, 95, 96]; the other 10 studies (71.4%) included only one cohort. The primary patient conditions in these MOF studies were acute respiratory distress syndrome (ARDS), six studies; sepsis, three studies; septic shock, two studies; pancreatitis, one study; critically ill patients, one study; and cardiac surgery with respiratory failure, one study.

Mortality Outcome

Of the 11 studies where CRRT was employed for MOF without ARF and the mortality data were presented, the overall mortality rate was 37.8% (56/148) [15, 88, 89, 91–94, 96–99]. This rate is significantly less than that of the 43 studies where patients with MOF and ARF were managed with CRRT (62.8%) ($p < 0.0001$). The mortality rate for the studies of ARDS patients was 40.0% (28/70) [15, 88, 89, 91, 92]. This rate is not dissimilar from that cited in the contemporary literature [101, 102]. Of the three studies where there were two groups for outcome comparison, the mortality was the same for the CRRT and control groups ($p \geq 0.05$) [15, 88, 96]. The mortality for the CRRT-treated septic shock patients was 35.3% (6/17) [96, 97], and it was 37.8% (37/98) for all septic patient groups, with or without shock or ARDS [91–9496, 97]. Others have not been convinced that CRRT for septic MOF without ARF has been proven to be clinically efficacious [78, 82, 103, 104].

Morbidity Outcome

Pulmonary Gas Exchange. Pulmonary gas exchange was improved in 10 of 11 patient groups managed with CRRT [1589–9193, 9497–100]. There was improvement in the one nonrandomized, prospective study with a control group [15]; but there was no improvement with CRRT in the single randomized, controlled trial [88]. Of the five ARDS patients in whom the change in pulmonary gas exchange was assessed, there was improvement in three, single-group studies [89–91], a better result in one study that was prospective and had a comparison group [15], and no difference in the sole randomized, controlled trial [88]. When other experts have reviewed the relevant literature, they have found evidence to suggest that CRRT enhanced pulmonary gas exchange [75, 82, 103, 104].

Hemodynamic Instability. The cardiovascular status before and after CRRT implementation for MOF was presented for nine studies. Hemodynamic instability was found to be improved with CRRT in six of nine studies [1592–9497, 100], but only one study was prospective and had a comparison group [15], and one investigation was prospective and without a comparison group [92]. Cardiovascular lability was not improved in three of nine studies; one study was a randomized, controlled trial [88]; the other two were retrospective and without a comparison group [89, 91]. A number of review articles have cited evidence that CRRT was associated with an improvement in hemodynamic instability [75, 82, 103].

Fluid Overload. The effect of CRRT on fluid balance was presented in four studies of MOF. Fluid overload was alleviated in two studies; one was prospective with a comparison group, [15] and one study was retrospective and without a comparison group

[99]. Input and output fluid balance was unchanged in two studies; both were retrospective and had no comparison groups [90, 91].

Sepsis. The degree of MOF-related sepsis was found to be diminished by CRRT in two studies; one was a randomized, controlled trial [96], and the other was a retrospective investigation without a comparison group [93].

Acidosis. Two studies indicated that CRRT alleviated the degree of metabolic acidosis in MOF patients; both studies were retrospective and without comparison groups [90, 91]. Others have indicated that there was important evidence that metabolic (lactic) acidosis was ameliorated with the institution of CRRT [75, 103, 104].

Miscellaneous. Nutritional support was found to be improved in one study where CRRT was used for MOF; this study was a retrospective investigation without a comparison group [99]. In a prospective study with a comparison group, oxygen consumption was found to be improved with CRRT [95]. In a literature review of patients with MOF and minimal or no renal failure, van Bommel noted an improvement in the APACHE III score following the use of CRRT [103].

Potential indications for CRRT in patients with MOF and minimal to no renal impairment include decreasing pulmonary edema, maintaining fluid balance, facilitating delivery of nutritional therapy, improving hemodynamics (cardiogenic or septic shock), improving gas exchange in ARDS patients, and removing inflammatory mediators in sepsis and MOF patients. The improved hemodynamic instability and pulmonary gas exchange seen with CRRT in MOF patients is thought to be explained only partly by its impact on fluid balance [82]. However, the nonrenal indications for CRRT can only be considered as speculative because most studies are small, retrospective, uncontrolled, and with case-mix heterogeneity [82, 103]. One expert indicated that the widespread application of CRRT for nonrenal indications should await more and properly designed clinical investigations [104]. More specifically, randomized, controlled trials or prospective, controlled studies of appropriate size, probably multicenter, in homogeneous patient groups with septic shock, systemic inflammatory response syndrome, or MOF and minimal or no renal failure are necessary to answer whether CRRT affects the clinical outcome positively [82, 103, 104].

Conclusions

There is compelling evidence that CRRT is associated with a survival advantage for patients with MOF and ARF when compared with IHD. Moreover, data suggest that CRRT, compared with IHD, is associated with more improvement in pulmonary gas exchange, hemodynamic instability, azotemia control, fluid overload, and nutritional support. In patients with MOF and minimal or no renal failure, there is little evidence to suggest that CRRT provides a survival benefit. Likewise, there are few credible data to suggest that CRRT offers an advantage for improvement in pulmonary gas exchange or hemodynamic instability. Most studies involving MOF patients without renal failure are retrospective, uncontrolled, and with small patient numbers. Additional randomized, controlled trials or prospective, controlled studies with appropriate numbers of patients demonstrating patient outcome enhancement are necessary before CRRT can be recommended for nonrenal failure patients with MOF.

Résumé

Etant donné que l'hémofiltration continue (HFC) semble faciliter l'épuration des médiateurs inflammatoires, cette revue évalue son impact sur la défaillance multiviscérale (DMV). *DMV avec insuffisance rénale aiguë (IRA)*: La mortalité globale chez 2313 patients sous HFC (43 études) a été de 62,8% comparée à 59,1% (p = 0,046) chez 961 patients en hémodialyse intermittente (HDI) (12 autres études). De 13 études comportant un groupe de comparaison HDI, trois ont montré que le risque était similaire dans les deux groupes, mais que la mortalité du groupe HDI était plus élevée; dans une, la mortalité du groupe HFC était plus basse mais le risque n'était pas donné alors que dans quatre, la mortalité était similaire avec un risque plus important pour l'HFC. La mortalité globale a été de 69,5% pour l'HDI. et de 63,2% pour l'HFC (p = 0,02). De six études comportant des groupes appariés (par l'âge et par score APACHE II), la mortalité d'HDI était plus élevée (70,9% vs. 60,1%, p = 0,01). Les échanges gazeux, l'instabilité hémodynamique, le contrôle de l'azotémie, la surcharge liquidienne et le soutien nutritionnel ont été meilleurs avec l'HFC. *DMV sans IRA*: De 14 études sur l'HFC (14,5 patients par étude), quatre seulement comportaient un groupe de comparaison. En ce qui concerne l'état des patients, six études avaient trait au SDRA, trois au sepsis, deux au choc septique, une à la pancréatite, une aux patients gravement atteints et une à la chirurgie cardiaque avec insuffisance respiratoire. De trois études avec un groupe de contrôle, la mortalité a été la même dans les deux groupes. Il existe peu de preuves que l'HFC puisse améliorer les échanges gazeux ou l'instabilité hémodynamique. Pour les patients présentant une DMV avec IRA, il existe de fortes preuves que, comparé à ceux sous HDI, les patients sous HFC aient une meilleure survie, de meilleurs échanges gazeux, une amélioration de l'instabilité hémodynamique, un meilleur contrôle de l'azotémie, de la surcharge des fluides et un meilleur soutien nutritionnel. Chez les patients ayant une DMV sans IRA, il existe peu de preuves que l'HFC améliore la survie, l'oxygénation ou la perfusion. Des essais contrôlés démontrant un bénéfice par HFC sont nécessaires avant de pouvoir recommander l'HFC chez le patient en DMV sans IRA.

Resumen

Dado que la terapia de sustitución renal continua (CRRT) puede mejorar la eliminación de los mediadores proinflamatorios, esta revisión trata de averiguar su efecto en los casos de fallo multiorgánico (MOF). *MOF con fallo renal agudo (ARF)*: La mortalidad global de 2,313 pacientes tratados con CRRT (43 estudios) fue del 62.8%. La mortalidad global de 961 pacientes (pertenecientes a 12 estudios diferentes) tratados con hemodialisis intermitente (IHD) fue del 59.1% (p = 0.046). De los 13 estudios realizados comparando la CRRT y la IHD, en tres, se constató que los grupos eran similares por lo que al riesgo se refiere, registrándose una mayor mortalidad con la IHD; en un solo estudio se observó una mortalidad menor con la CRRT, (pero se desconoce el grado de riesgo por no estar indicado); en 4 estudios la mortalidad fue similar siendo mayor el riesgo en los tratados con CRRT. La mortalidad acumulada para la IHD fue

del 69.5% y para la CRRT del 63.9% (p = 0.2). En los seis estudios con grupos homogéneos por lo que a la edad y puntuación en la escala APACHE II se refiere, la mortalidad con IHD fue mayor (70.9% vs 60.1%, p = 0.01). Con el tratamiento CRRT mejora el intercambio gaseoso pulmonar, la inestabilidad hemodinámica, el control de la azotemia, la sobrecarga de fluidos y el soporte nutricional. *MOF sin ARF*. De los 14 estudios sobre el CRRT (14.5 pacientes por estudio) sólo 4 presentaban grupos comparativos. El estado clínico de los pacientes fue: síndrome de insuficiencia aguda respiratoria (ARDS) (estudiado en 6 trabajos), sepsis (en tres), shock séptico (en dos), pancreatitis (en uno), enfermedad crítica (en uno), cirugía cardiaca con fallo respiratorio (un trabajo). En los tres estudios que presentaban grupo control, la mortalidad fue la misma. La CRRT mejora mínimamente el intercambio gaseoso pulmonar y la inestabilidad hemodinámica. En pacientes con MOF y ARF es evidente que la CRRT aumenta la supervivencia mas que la IHD, mejorando mucho más el intercambio gaseoso pulmonar, la inestabilidad hemodinámica, el control de la azotemia, la sobrecarga hídrica y el aporte nutricional. En pacientes con MOF pero sin fallo renal (ARF) no parece que la CRRT aumente la supervivencia ni mejore la oxigenación ni la perfusión. Se precisan estudios controlados que demuestren que la CRRT es beneficiosa antes de poder ser recomendada esta terapia en pacientes con MOF pero sin ARF.

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