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FULL PAPER

Medical evaluation of the effectiveness and outcome of regional anesthesia in burn populations to reduce drug use: a systematic review and meta-analysis

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The results of regional anesthesia (RA) techniques on pain relief and narcotic consumption are challenging and should be evaluated. Hence, the purpose of the present article was to evaluate the efficacy and outcome of RA in adult patients with burns to decrease narcotic consumption and pain. The initial search was performed by two blind and independent browsers in electronic databases (PubMed, Cochrane Library, and Embase) until May 2021. For data analysis, after extracting the data of three studies that met the inclusion criteria, the mean and risk difference methods were used with a 95% confidence interval, the fixed-effect model and the Mantel-Haenszel/inverse variance method were used were calculated for the data. Stata software version 16, a faster version of Stata, was used for statistical analysis. 24 articles were found in the initial review, the abstracts reviewed by two blind and independent authors. Finally, after reviewing the full text of 9 articles, 3 articles were selected. The mean difference of cumulative Morphine requirements was -49.01 (MD, -49.01 95% CI 56.36, -41.67. P-VALUE=0.00) between continuous RA and control group of cumulative Morphine requirements. Meta-analysis showed that both RA had statically significantly lower total morphine consumption than the control group. Meta-analysis showed RA reduced total morphine consumption and pain.

KEYWORDS

Regional anesthesia; burn population; narcotic consumption; pain.

Introduction

Skin graft donor site management is one of the most critical and challenging issues in clinical care after burn injury. Studies have shown that multimodal pain management is also needed for burns that require autologous skin grafting. Also, by controlling pain after skin graft harvest, the need for readmission can be extended, hospitalization time extended, total narcotic use reduced, and costs reduced [1-3]. The use of regional nerve blocks in combination with narcotics can be beneficial in pain management; Studies have shown that Peripheral nerve blocks can lead to hospital stays, reduced use of narcotics, and lower pain scores [4-6]. Few studies have been performed to evaluate regional anesthesia (RA) at skin graft donor-site pain. The results of RA techniques on pain relief and narcotic consumption are challenging and should be evaluated [7]. Hence, the present study's purpose was to evaluate the efficacy and outcome of RA in a population of adult burn

injury patients to diminish narcotic consumption [8].

Methods

Search strategy

Systematic literature searches were performed by May 2021 in electronic databases including PubMed, Cochrane Library, Embase, Endnote X8 software was used for reference, PubMed database was searched based on mesh expressions. The present study is based on the critical considerations of the PRISMA [9] statement and used to achieve the results of the PICO strategy (Table 1).

Selection criteria

Inclusion criteria: Randomized controlled trials (RCT) studies, prospective and retrospective cohort studies, adult burn injury patients, and published in the English language. In vitro studies, reviews, animal studies and clinical studies, and incomplete data were excluded [10-12].

TABLE 1 PICO strategy

PECO Strategy	Description
P	Population: Burn population
I	Intervention: Regional anesthesia
C	Comparison: Standard narcotic regimen
O	Outcome: pain and narcotic consumption

Data Extraction and method of analysis

Cochrane Collaboration [13] and MINORS tools were used to evaluate the quality of RCT and Non-RCT studies; Thus, in the Cochrane Collaboration tool, scores were considered 1 for low risk and 0 for high and uncertain risk; A score higher than 4 indicated the high quality of the study. A score above 16 in the MINORS instrument indicated higher study quality [14].

Two browsers independently reviewed the data of the selected studies and were then reviewed and validated by the third browser. Meta-analysis was performed using STATA software version 16; 95% confidence interval (CI) of the mean difference with the fixed-effect model and inverse variance method was performed [15-17]. The fixed-effect model and Mantel-Hansel method were used to investigate the risk difference. Random effects were used to evaluate the heterogeneity between studies; The I2 coefficient indicates heterogeneity; If this number is above 50%, it indicates high heterogeneity in the studies ($p<0.05$), and vice versa, it indicates low heterogeneity ($p> 0.05$) [18-20].

Results

The initial search of the databases was performed with the desired keywords, at this stage, 24 articles were found, one article was repeated twice, which was removed from the study, and the abstract of 23 studies was reviewed; Studies that did not meet the inclusion criteria or included exclusion criteria were excluded from the study. Finally, the full text of 9 studies was reviewed, and studies that had incomplete data or were not in line with the purpose of the present study were excluded from the study. Finally, three articles were selected (Figure 1).

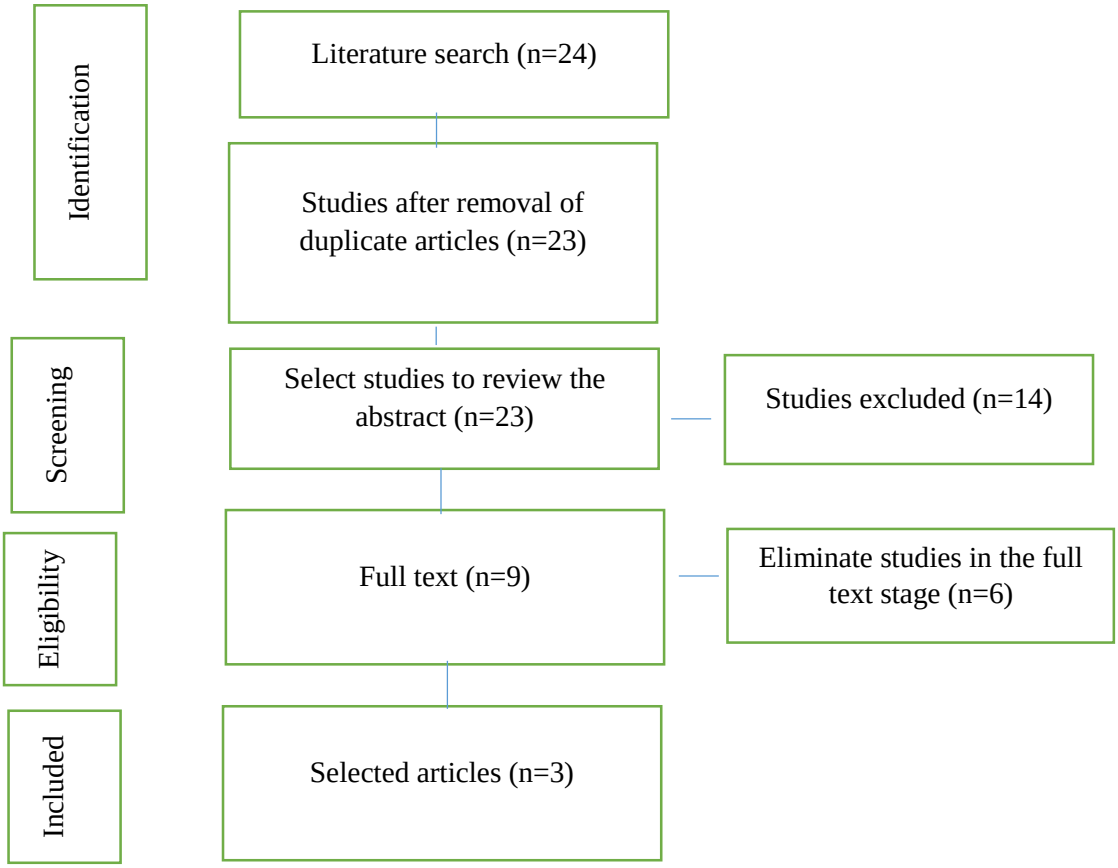

FIGURE 1 Study attrition

Characteristics

Three studies (RCT study and two prospective cohort studies) were included. The number of patients in the RA and control group was 47, a total of 94. 94 participants requiring split-skin grafting for burn injuries between 15-18% total body surface areas were randomized to control (74 participants) or intervention group (47 participants) (Table 2).

TABLE 2 Summary of data extracted from studies

Study. Years	Study design	Number of patients		Mean/rang of age (years)	Block/Regimen		total burn surface area	bias assessment
		RA group	Control group		RA group	Control group		
Town *et al.*,2021 [8]	RCT	10	10	>18	ultrasound-guided facia iliaca plane block prior	Femoral catheter	<15%	5/6
Cuignet *et al.*,2005 [9]	prospective	27	27	>18	Fascia iliaca compartment block ¼ via femoral catheter	Femoral catheter	18%	24/24
Cuignet *et al.*,2004 [10]	prospective	10	10	18-80	Fascia iliaca compartment block ¼ via femoral catheter	Femoral catheter	16%	21/24

Bias assessment

According to Cochrane Collaboration tool, one study [21] had an overall score of 5/6, also according to MINORS score, one study had an overall score of 21/24 [22], and one study had an overall score of 24/24 [23]. This result revealed a low risk of bias in all studies.

Morphine consumption

Mean difference of cumulative Morphine requirements was -49.01 (MD, -49.01 95% CI 56.36, -41.67. p-value= 0.00) and heterogeneity was high (I^2=95.35%; P =0.00). There was a statistically significant difference between continuous RA and the control group of cumulative Morphine requirements (Figure 2). Mean difference of cumulative Morphine requirements was -49.07 (MD, -49.01 95% CI 56.14, -42.00. P-value=0.00) and heterogeneity was high (I^2=95.21%; P =0.00). There was a statistically significant difference between single-shot RA and the control group of cumulative Morphine requirements (Figure 3). This result showed both RA had statically significantly lower total morphine consumption.

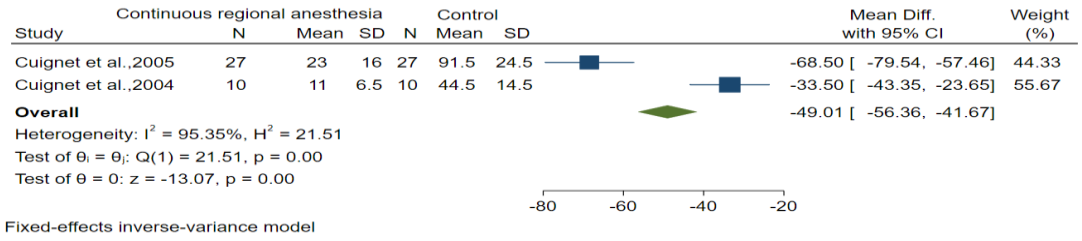

FIGURE 2 The Forest plot showed Cumulative Morphine Requirements between continuous RA and control group

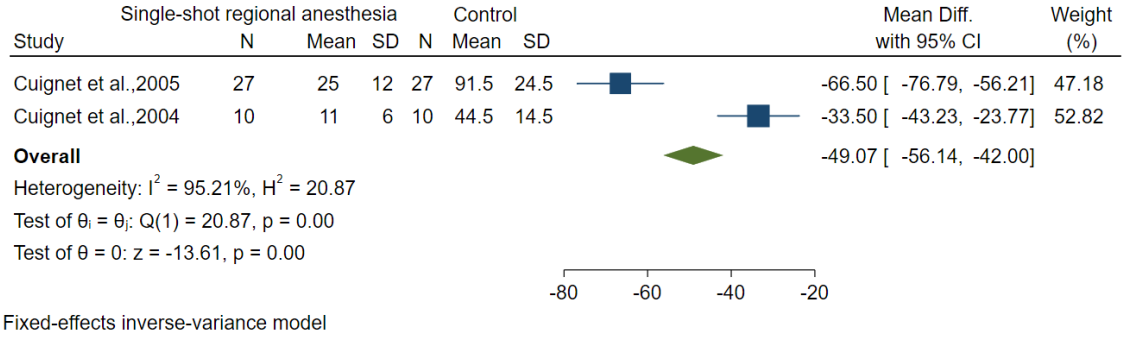

FIGURE 3 Forest plot showed Cumulative Morphine Requirements between single-shot RA and control group

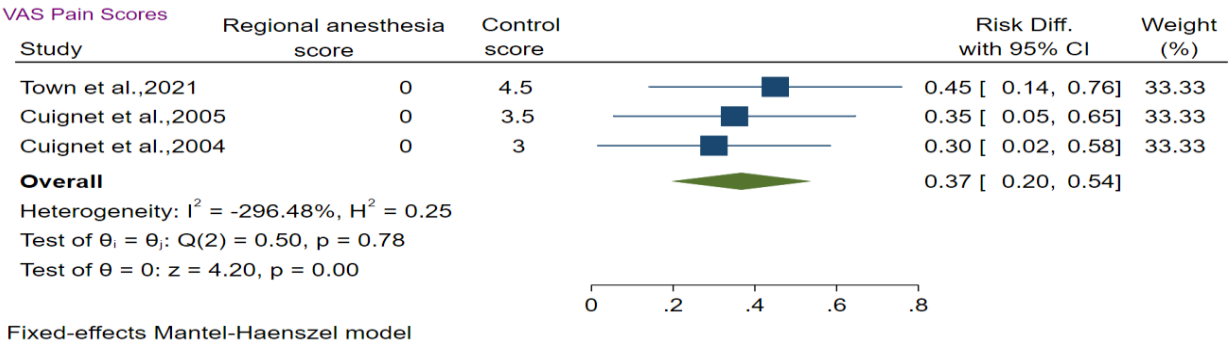

FIGURE 4 The Forest plot showed Donor Site VAS Pain Scores

Pain

The difference of Donor Site Visual Analog Scale (VAS) Pain Scores was 0.37 (RR, 0.37 95% CI 20, 54. P-value= 0.00) and heterogeneity was low (I^2<0%; P =0.78). There was a statistically significant difference between continuous RA and the control group of pain scores (Figure 4). In all studies, Donor Site VAS pain score in the continuous RA group reported 0. The results demonstrated continuous RA improved analgesia [24-26].

The difference of Dynamic Visual Analog Scale (VAS) Pain Scores was 0.50 (RR, 0.50 95% CI 0.30, 0.70. P-value = 0.00) and heterogeneity was low (I^2<0%; P-value=0.70). There was a statistically significant difference between continuous RA and the control group of pain scores (Figure 5). The difference of Dynamic Visual Analog Scale (VAS) Pain Scores was 0.37 (RR, 0.37 95% CI 0.14, 0.59. P P-value=0.00) and heterogeneity was low (I^2<0%; P-value=0.70). There was a statistically significant difference between single-shot RA and the control group's pain score (Figure 6). RA appears to decrease pain during hip flexion and dynamic movement [27].

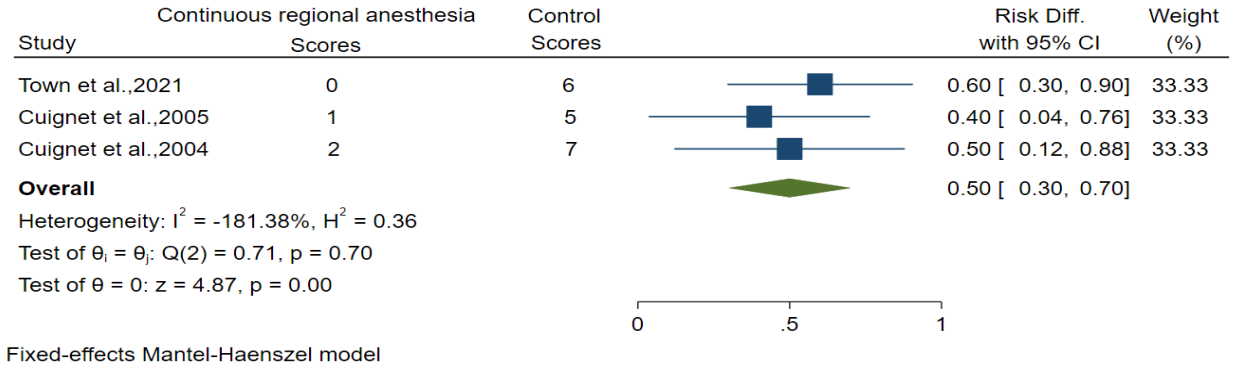

FIGURE 5 Forest plot showed Dynamic VAS Pain Scores between continuous RA and control group

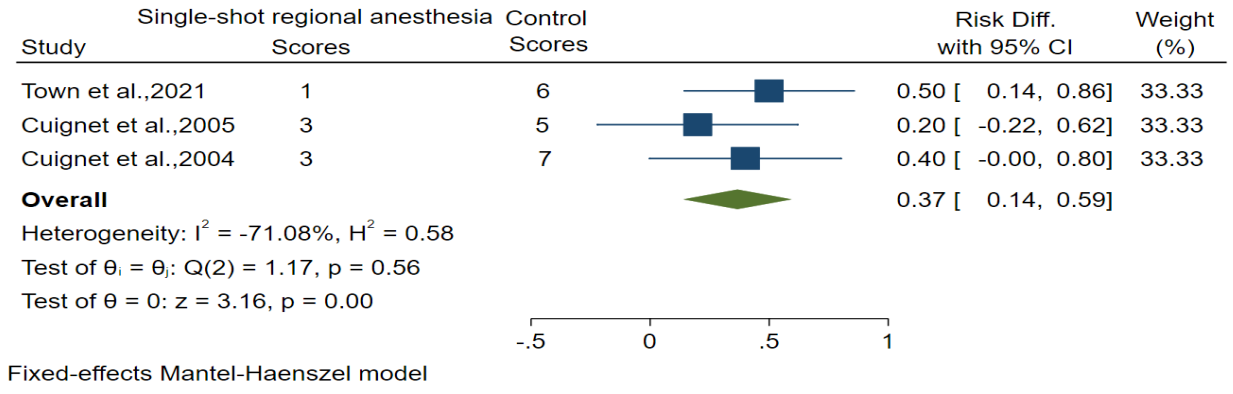

FIGURE 6 Forest plot showed Dynamic VAS Pain Scores between single-shot RA and control group

Discussion

Few studies have been performed on RA skin graft donor-site pain management [31-33]. The present study was conducted to evaluate the effectiveness and outcome of RA in the population of adult burn injury patients to diminish narcotic consumption and pain [34]. In the present study, only three studies were found that were steady with the reason of the study, the low risk of bias reported according to RCT and Non-RCT tools [35-37]. Still, in some results, high heterogeneity was observed between studies. The present study

results showed that RA would significantly reduce pain and narcotic consumption compared to the control group [38]. Other studies have examined variables such as using a local anesthetic cream and tumescent solution before transplantation [39-41]. Burn injuries cause severe pain and predispose the patient to increased narcotic consumption to reduce pain [42]. One of the goals of RA is to reduce narcotic consumption. Studies reported RA has side effects such as toxicity of anesthesia, temporary muscle weakness, and catheter-related infections. Advance studies are required to evaluate RA and length of hospital stay.

Conclusion

This study showed that RA can reduce pain in burns. Some studies have shown that the average of patients with burns is around 8.8 to 12.3%. Also, the average length of hospital stays for patients with 10% average TBSA was 14 days. In the present study, accurate tools were used to evaluate the low-quality studies. Further studies in this area are needed to provide strong evidence. Regional anesthesia is an essential critical issue of pain management in reconstructive burn surgery. The result showed RA reduced total morphine consumption and pain. Further studies, especially RCT studies, are required to supply more grounded proof by assist study.

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References

[1] A. Susanabadi, S. Etemadi, M.S. Sadri, B. Mahmoodiyeh, H. Taleby, M. Milani Fard, *Ann. Rom. Soc. Cell Biol.*, **2021**, *25*, 2875–2887. [Crossref], [Google Scholar], [Publisher]

[2] F.E. Sadr, Z. Abadi, N.E. Sadr, M. Milani Fard, *Ann. Rom. Soc. Cell Biol.*, **2021**, *25*, 6839-6852. [Crossref], [Google Scholar], [Publisher]

[3] H. Jahandideh, A. Yarahmadi, S. Rajaieh, A. Ostvar Shirazi, M. Milani Fard, A. Yarahmadi, *JPRI*, **2019**, *31*, 1-7. [Crossref], [Google Scholar], [Publisher]

[4] K. Ghajarzadeh, M. Milani Fard, H. Alizadeh Otaghvar, S.H.R. Faiz, A. Dabbagh, M. Mohseni, S.S. Kashani, A.M. Milani Fard, M.R. Alebouyeh, *Ann. Rom. Soc. Cell Biol.*, **2021**, *25*, 2457–2465. [Crossref], [Google Scholar], [Publisher]

[5]K. Ghajarzadeh, M. Milani Fard, H. Alizadeh Otaghvar, S.H.R. Faiz, A. Dabbagh, M. Mohseni, S.S. Kashani, A.M. Milani Fard, M.R. Alebouyeh, *Ann. Rom. Soc. Cell Biol.*, **2021**, *25*, 2449–2456. [Crossref], [Google Scholar], [Publisher]

[6]K. Ghajarzadeh, M. Milani Fard, M.R. Alebouyeh, H. Alizadeh Otaghvar, A. Dabbagh, M. Mohseni, S.S. Kashani, A.M. Milani Fard, S.H.R. Faiz, *Ann. Rom. Soc. Cell Biol.*, **2021**, *25*, 2466-2484. [Crossref], [Google Scholar], [Publisher]

[7]R. Alimoradzadeh, H. Mirmiranpour, P. Hashemi, S. Pezeshki, S.S. Salehi, *J. Neurology Neurophys.*, **2019**, *10*, 1000483. [Pdf], [Google Scholar], [Publisher]

[8]R. Alimoradzadeh, M. Mokhtare, S. Agah, *Iran. J. Age.*, **2017**, *12*, 78-89. [Crossref], [Google Scholar], [Publisher]

[9]S. Etemadi, B. Mahmoodiyeh, S. Rajabi, A. Kamali, M. Milani Fard, *Ann. Rom. Soc. Cell Biol.*, **2021**, *25*, 2417-2426. [Pdf], [Google Scholar], [Publisher]

[10] M. Mokhtare, R. Alimoradzadeh, S. Agah, H. Mirmiranpour, N. Khodabandehloo, *Middle East J. Dig. Dis.*, **2017**, *9*, 228-234. [Crossref], [Google Scholar], [Publisher]

[11] R. Alimoradzadeh, M.A. Abbasi, F. Zabihi, H. Mirmiranpour, *Iran. J. Age.*, **2021**, *15*, 524-533. [Crossref], [Google Scholar], [Publisher]

[12] M.B. Abhari, P.F. Afshar, R. Alimoradzadeh, H. Mirmiranpour, *Immunopathologia Persa*, **2019**, *6*, e10. [Crossref], [Google Scholar], [Publisher]

[13] S.G.R. Mortazavi Moghaddam, G.R. Sharifzadeh, M.R. Rezvan, *Iran J. Med. Sci.,*

2016, *41*, 322-327. [Google Scholar], [Publisher]
[14] G. Mortazavi Moghaddam, H. Akbari, A.R. Saadatjoo, *Iran J. Med. Sci.,* **2005**, *30*, 110-114. [Google Scholar], [Publisher]
[15] G. Mortazavi Moghaddam, A.R. Saadatjoo, *Iran J. Med. Sci.,* **2014**, *39*, 418-423. [Google Scholar], [Publisher]
[16] F. Zabihi, M.A. Abbasi, R. Alimoradzadeh, *Ann. Rom. Soc. Cell Biol.,* **2019**, *1*, 2573-2579. [Pdf], [Google Scholar], [Publisher]
[17] A. Firoozfar, M. Dousti, *Mag. Civ. Eng.*, **2019**. *90*, 119-129. [Crossref], [Google Scholar], [Publisher]
[18] A. Sharma, S. Tiwari, M.K. Deb, J.L. Marty, *Int. J. Antimicrob.*, **2020**, *56*, 106054. [Crossref], [Google Scholar], [Publisher]
[19] A. Zali, M.R. Sohrabi, A. Mahdavi, N. Khalili, M.S. Taheri, A. Maher, M. Sadoughi, A. Zarghi, S.A. Ziai, A.A. Shabestari, M. Bakhshayeshkaram, *Acad. Radiol.*, **2020**, *28*, 1654-1661. [Crossref], [Google Scholar], [Publisher]
[20] A.J. Rodriguez-Morales, J.A. Cardona-Ospina, E. Gutiérrez-Ocampo, R. Villamizar-Peña, Y. Holguin-Rivera, J.P. Escalera-Antezana, L.E. Alvarado-Arnez, D.K. Bonilla-Aldana, C. Franco-Paredes, A.F. Henao-Martinez, A. Paniz-Mondolfi, *Travel Med. Infect. Dis.*, **2020**, *34*, 101623. [Crossref], [Google Scholar], [Publisher]
[21] C.C. Lai, T.P. Shih, W.C. Ko, H.J. Tang, P.R. Hsueh, *Int. J. Antimicrob.*, **2020**, *55*, 105924. [Crossref], [Google Scholar], [Publisher]
[22] C.R. Jutzeler, L. Bourguignon, C.V. Weis, B. Tong, C. Wong, B. Rieck, H. Pargger, S. Tschudin-Sutter, A. Egli, K. Borgwardt, M. Walter, *Travel Med. Infect. Dis.*, **2020**, *37*, 101825. [Crossref], [Google Scholar], [Publisher]
[23] Z. Cheng, Y. Lu, Q. Cao, L. Qin, Z. Pan, F. Yan, W. Yang, *Am. J. Roentgenol.*, **2020**, *215*, 121-126. [Crossref], [Google Scholar], [Publisher]
[24] F. Fu, J. Lou, D. Xi, Y. Bai, G. Ma, B. Zhao, D. Liu, G. Bao, Z. Lei, M. Wang, *Eur. Radiol.*, **2020**, *30*, 5489-5498. [Crossref], [Google Scholar], [Publisher]
[25] F. Shi, J. Wang, J. Shi, Z. Wu, Q. Wang, Z. Tang, K. He, Y. Shi, D. Shen, *IEEE Rev. Biomed. Eng.*, **2020**, *14*, 4-15. [Crossref], [Google Scholar], [Publisher]
[26] B.K.K. Fields, N.L. Demirjian, H. Dadgar, A. Gholamrezanezhad, *Semin. Nucl. Med.*, **2020**, *51*, 312-320. [Crossref], [Google Scholar], [Publisher]
[27] J. Liu, H. Yu, S. Zhang, *Eur. J. Nucl. Med. Mol. Imaging.*, **2020**, *47*, 1638-1639. [Crossref], [Google Scholar], [Publisher]
[28] M. Dousti, A. Firoozfar, *J. Eng. Ind. Res.*, **2022**, *3*, 54-68. [Crossref], [Google Scholar], [Publisher]
[29] M. Mokhtare, R. Alimoradzadeh, S. Agah, H. Mirmiranpour, N. Khodabandehloo, *Middle East J. Dig. Dis.,* **2017**, *9*, 228-234. [Crossref], [Google Scholar], [Publisher]
[30] M.B. Abhari, P.F. Afshar, R. Alimoradzadeh, H. Mirmiranpour, *Immunopathologia Persa*, **2019**, *6*, e10. [Google Scholar], [Publisher]
[31] S. Ghorbanizadeh, Y. Raziani, M. Amraei, M. Heydarian, **2021**, *12*, 54-58. [Crossref], [Google Scholar], [Publisher]
[32] Y. Raziani, B.S. Othman, S. Raziani, **2021**, *Ann. Med. Surg., 69*, 102739. [Crossref], [Google Scholar], [Publisher]
[33] Y. Raziani, B.S. Othman, **2021**, *Veins and Lymphatics, 10*, 5-10. [Google Scholar], [Publisher]
[34] Y. Raziani, S. Raziani, **2021**, *Journal of Chemical Reviews, 3*, 83-96. [Crossref], [Google Scholar], [Publisher]
[35] Z.L. Zhang, Y.L. Hou, D.T. Li, F.Z. Li, *Scand. J. Cin. Lab. Invest.*, **2020**, *80*, 441-447. [Crossref], [Google Scholar], [Publisher]
[36] B. Nazari, L. Amani, L. Ghaderi, M. Khanbabayi gol, *E Trauma Monthly.* **2020**, *25*, 262-268. [Crossref], [Google Scholar], [Publisher]
[37] K. Hashemzadeh, M. Dehdilani, M.K. Gol, *Int. J. Womens Health Reprod. Sci.,* **2021**, *9*, 69-74. [Crossref], [Google Scholar], [Publisher]

[38] K. Hashemzadeh, M. Dehdilani, M. Khanbabayi gol, *Int. J. Womens Health Reprod. Sci.*, **2020**, *8*, 406-411. [Google Scholar], [Publisher]
[39] N. Shahidi, F. Mahdavi, M.K. Gol, *J. Educ. Health Promot.*, **2020**, *9*, 153. [Crossref], [Google Scholar], [Publisher]
[40] R. Eghdam-Zamiri, M. Khanbabayi Gol, *Iran. J. Obstet. Gynecol. Infertil.*, **2020**, *22*, 15-21. [Crossref], [Google Scholar], [Publisher]
[41] V. Poortahmasebi, M. Zandi, S. Soltani, S.M. Jazayeri, *Adv. J. Emerg. Med.*, **2020**, *4*, e57. [Google Scholar], [Publisher]
[42] S. Khosravani, F. Handjani, R. Alimohammadi, N. Saki, *Int. Sch. Res. Notices,* **2017**, *24*, 6053267. [Crossref], [Google Scholar], [Publisher]

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