Improving Pregnancy Rate in IVF Cycles by Preparing Sperm via Microfluidic Sperm Chips

Alagöz O.[1], Özkara G.[1], Koçer Yazıcı M. G. [1], Fıçıcıoğlu C. [1]
[1] Yeditepe University Hospital, IVF Center, Istanbul, Turkey.

INTRODUCTION

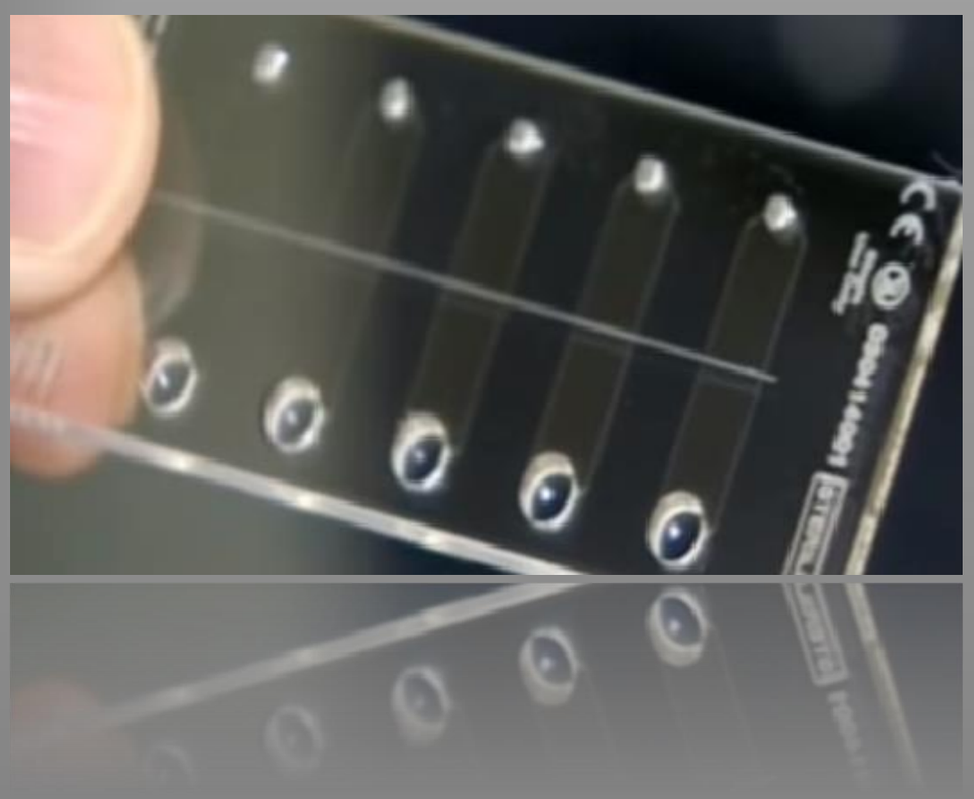
Effect of microfluidic sperm chips to sperm motility and DNA integrity improvement is already known by some studies. Although, microfluidic technologies were introduced in ART field at the beginning of 21st century and are being advanced from day to day, there is still no prevailing utilization in laboratories and there are few studies presenting their effect on ART outcomes.

This is a retrospective, randomized study evaluating the data of 185 patients between December 2014 and January 2017. Patients were grouped according to sperm preparation technique (88 patients for chip and 97 patients for Percoll). Patients were further grouped by the number of their previous cycles (3 groups: 0-1, 2-3, 4 and more). Chip effect was compared in each group in terms of fertilization, pregnancy and implantation rates.

METHODS

Semen was applied into chip according to manufacturer's instructions. 90% density gradient (monolayer) was used in percoll method. Sperm was injected 39-40 hours post hCG. Fertilization rate was defined as % of 2PN oocytes per total injected MII oocytes. Implantation rate was defined as % of gestational sacs per embryo transferred. Pregnancies were evaluated according to serum hCG concentration 12-14 days after embryo transfer. Biochemical pregnancies were accepted as negative. Statistical analysis was performed using SPSS 20.0. Chi-square test (χ^2) was carried out for method/ pregnancy comparisons. Statistically significant results were further analysed by regression analysis. Mann-Whitney U test was performed to assess fertilization and implantation rates in groups.

Figure 1: Microfluidic Sperm Chip



RESULTS

Statistically significant result was obtained between chip and percoll method in terms of pregnancy rate (p:0.03). 1,97 fold increase was found to improve pregnancy rate with chip utilization as sperm preparation method in all patients. Fertilization and implantation rates were not found statistically significant between two groups (p>0.05).

Table 1: Demographic and clinical characteristics of the study groups (chip/percoll)

	Method	N	Mean	Std. Deviation	p value
Age	Chip	88	34.20	4.382	0.029
	Percoll	97	32.14	4.763	
Pregnancy (yes/no)	Chip	88 (38/53)	.43 (43.2%)	.498	*0.030 Exp (B): 1.97*
	Percoll	97 (27/70)	.28 (27.8%)	.451	
Fertilization Rate %	Chip	88	85.6181	15.60133	0.650
	Percoll	97	84.6905	15.81822	
Implantation Rate %	Chip	85	31.76	42.150	0.066
	Percoll	95	21.58	38.352	
Previous Cycle	Chip	88	2.10	2.398	0.051
	Percoll	97	1.46	1.969	
Sperm Count (mil/ml)	Chip	88	39.94	33.158	0.019
	Percoll	97	53.11	42.439	
Sperm Motility %	Chip	88	50.18	16.478	0.715
	Percoll	97	51.09	17.272	
Sperm Progressive Motility %	Chip	88	41.11	17.937	0.854
	Percoll	97	41.61	18.449	
Sperm Morphology %	Chip	88	1.40	1.150	0.054
	Percoll	97	1.73	1.195	

Chip utilization had no effect on pregnancy, fertilization and implantation rates in Group 1 and 3 (p>0.05). However, chip utilization improved pregnancy and implantation rates (p: 0.01, p: 0.02, respectively) in Group 2. 4.83 fold increase was found at pregnancy rate by chip utilization in Group 2.

Table 2: Effect of Chip Utilization on Pregnancy, Fertilization and Implantation Rates According to Previous IVF Cycles

	Group 1 (Previous IVF cycles: 0-1)		Group 2 (Previous IVF cycles: 2-3)		Group 3 (Previous IVF cycles: 4 and more)	
Pregnancy % (yes/no)	Chip	43.5% (20/26)	Chip	56% (14/11)	Chip	23.5% (4/13)
	Percoll	32.8% (20/41)	Percoll	20.8% (5/19)	Percoll	16.7% (2/10)
	p value	0.259	p value	*0.014 Exp (B): 4.83*	p value	0.655
Fertilization Rate %	Chip	88.7%	Chip	84.1%	Chip	79.9%
	Percoll	86.5%	Percoll	80.2%	Percoll	82.9%
	p value	0.498	p value	0.487	p value	0.811
Implantation Rate %	Chip	35.2%	Chip	37.5%	Chip	14.7%
	Percoll	28.6%	Percoll	14.5%	Percoll	4.5%
	p value	0.405	p value	*0.022*	p value	0.517

CONCLUSION

As one of the novel sperm preparation technologies, microfluidic sperm chips increase pregnancy rates in IVF cycles comparing to conventional gradient centrifugation method.

33rd Annual Meeting of ESHRE, 2-5 July 2017 Geneva-Switzerland